Rock Products

$2.00 A YEAR CHICAGO NOVEMBER 8, 1919

Rock Products

TRADEPRESS PUBLISHING CORPORATION
542 SOUTH DEARBORN STREET
CHICAGO

NATHAN C. ROCKWOOD, Editor CHAS. H. FULLER, Manager C. F. TREFZ, Associate Editor

Vol. XXII, No. 23 November 8, 1919

Printing of this issue, 4,000 copies

Second class entry at U. S. Post Office.

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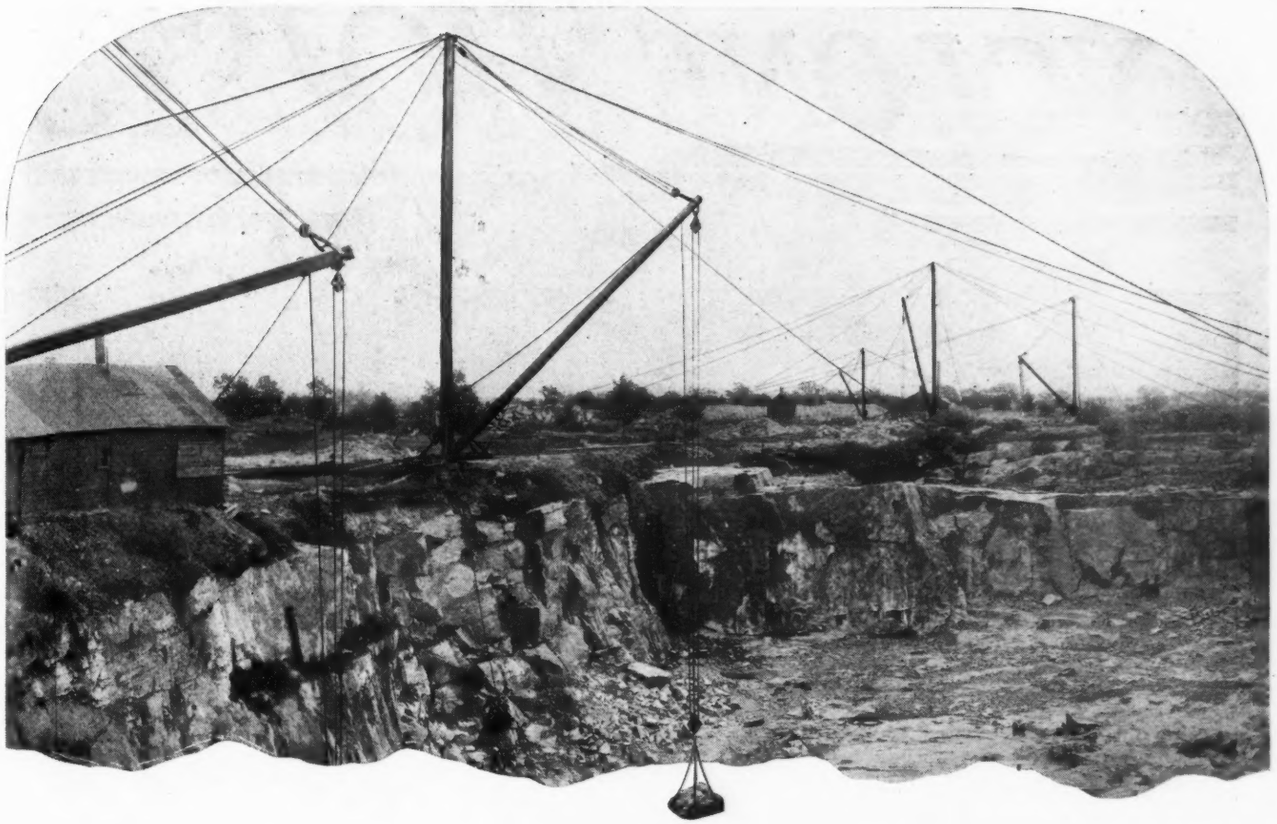
ALPHABETICAL LIST OF ADVERTISERS

PUBLISHED EVERY OTHER SATURDAY by the Tradepress Publishing Corporation, 542 South Dearborn St., Chicago, Ill., U. S. A. W. D. Callender, president; T. J. Sullivan, vice-president; George P. Miller, Treas.; C. H. Fuller, Secy.

SUBSCRIPTION

$2 a year in United States; $3 a year, Canada and foreign. Single copies, 20 cents. Date on wrappers indicates issue with which your subscription expires. In writing to have address changed, give old as well as new address.

Entered as second class matter July 2, 1907, at the Postoffice at Chicago; under act of March 3, 1879.



Nine hoists in every ten are "Americans"

PREVIOUS to 1891 the large granite rocks quarried in the famous St. Cloud, Minnesota, district were handled by horse power hoists.

During that year Tom Breen, then a prominent quarryman of the Northwest, purchased the district's first steam operated hoist. It carried the "American" name plate.

Today—twenty-eight years later—that same "American" Hoist is still in service. There are now twenty quarries in the district. Ninety per cent of all the hoists and derricks in this district are "Americans."

No more eloquent expression of appreciation for "American" quality, design and service could be desired. You, too, will share that appreciation after your first "American" Hoist has been placed in service.

No matter what your requirements may be, there's an "American" to meet your needs.

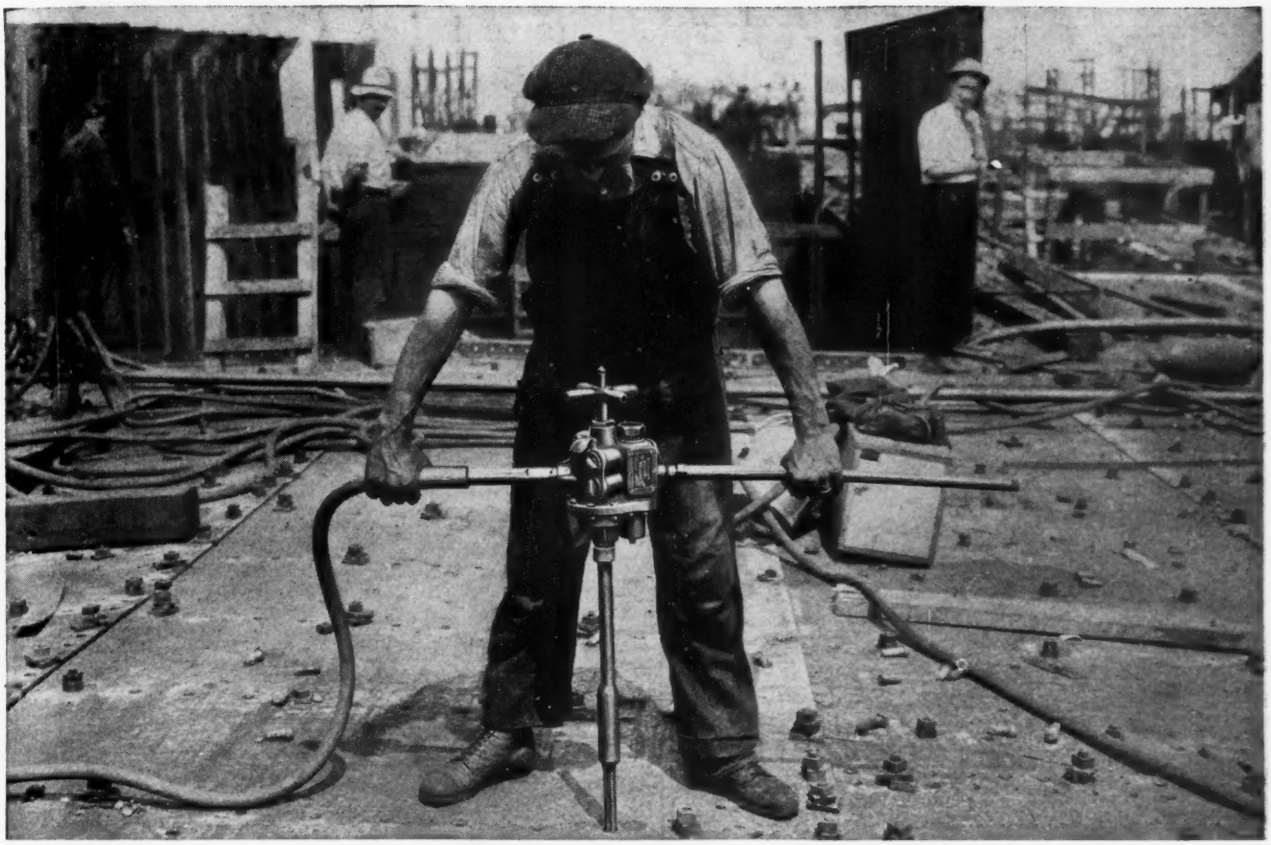
No matter where you are, an "American" representative can reach you in twenty-four hours.

American Hoist & Derrick Co.
Saint Paul Minnesota

New York Chicago Seattle Pittsburgh New Orleans Detroit

AMERICAN
HOIST & DERRICK CO.

Cooperation is the thing—please mention ROCK PRODUCTS



It Holds the Pressure and Resists Oil

The marked capacity of Goodyear Monterey Hose to deliver the full power of your working pressure under all conditions depends primarily on three distinct qualities.

Body fabric of the highest grade and free from wire winding gives natural play to the pulsating forces of continual expansion and contraction, and insures against kinking, cracking, or bursting.

Decidedly superior in point of non-porosity, Goodyear Monterey Hose holds the air that is vital to your tools.

Especially resistant to the action of the vaporized oil that inevitably works its way from the condenser through the air line, Goodyear Monterey Hose is long-lived.

Because of its light weight and flexibility, Goodyear Monterey Air Hose is easily handled at heights, and in awkward corners. Its extra cover successfully resists abrasion. The firm resilience of its quick, live rubber combats the rough usage that is sure to be part of the job.

You can get Goodyear Monterey Hose in 25- and 50-foot lengths. With all its advantages, Goodyear Monterey costs but little more in the first place than ordinary hose. Its final cost, measured in power delivered, in efficient operation, in lasting quality, is decidedly lower.

THE GOODYEAR TIRE & RUBBER COMPANY
Offices Throughout the World

BELTING · PACKING · HOSE · VALVES

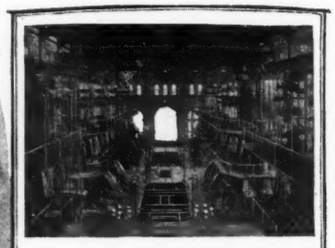
GOODYEAR

MADE IN U.S.A.

The advertiser wants to know that you saw his ad in ROCK PRODUCTS

First Units installed 1889
Last one added 1919

Worthington specified every time



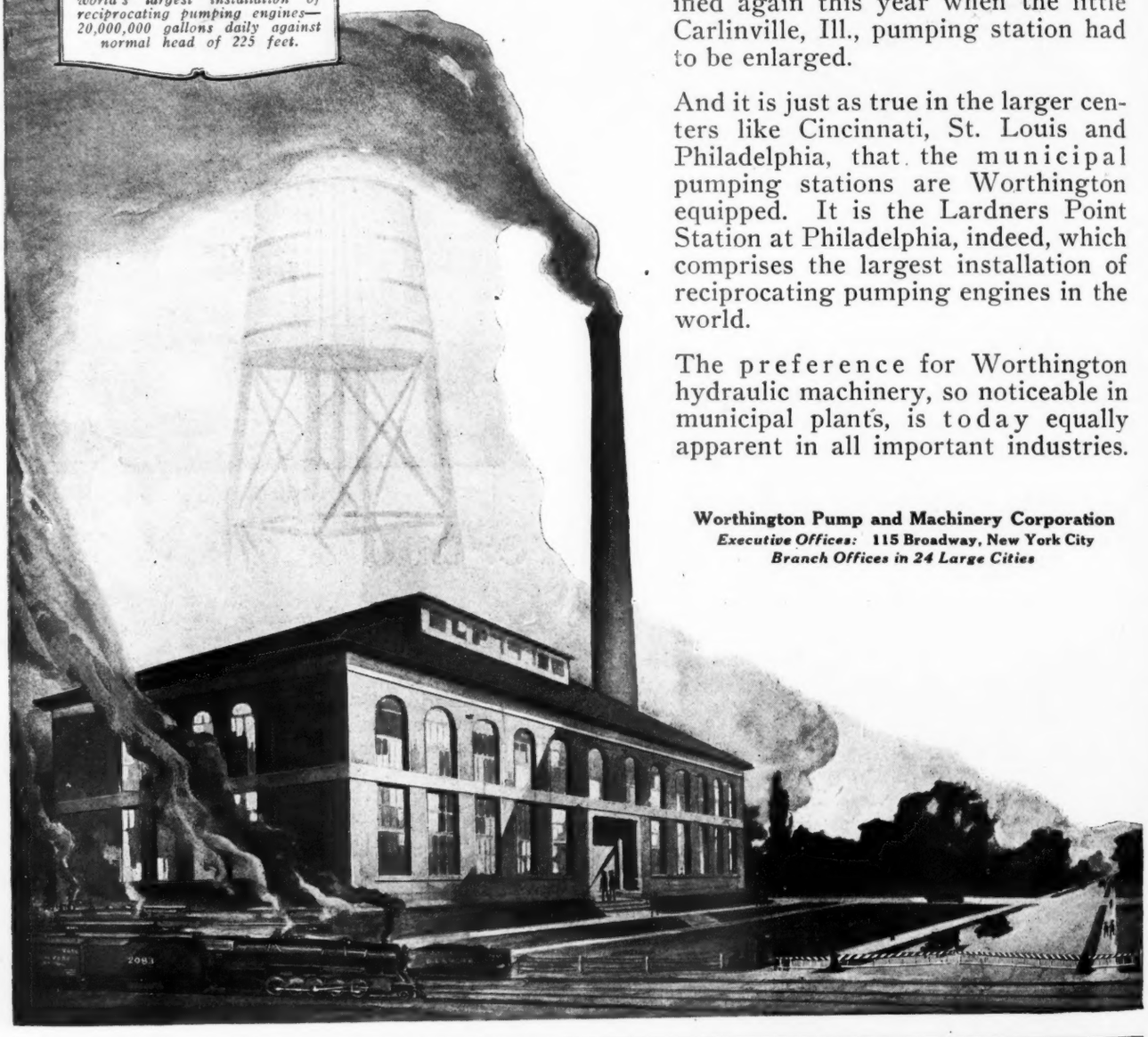
The 12 Worthington units in the Lardners Point Pumping Station at Philadelphia comprise the world's largest installation of reciprocating pumping engines—20,000,000 gallons daily against normal head of 225 feet.

AFTER the 30-year record of units numbers 1 and 2 it was only natural that Worthington should be specified again this year when the little Carlinville, Ill., pumping station had to be enlarged.

And it is just as true in the larger centers like Cincinnati, St. Louis and Philadelphia, that the municipal pumping stations are Worthington equipped. It is the Lardners Point Station at Philadelphia, indeed, which comprises the largest installation of reciprocating pumping engines in the world.

The preference for Worthington hydraulic machinery, so noticeable in municipal plants, is today equally apparent in all important industries.

Worthington Pump and Machinery Corporation
***Executive Offices:* 115 Broadway, New York City**
Branch Offices in 24 Large Cities



PUMPS–COMPRESSORS–CONDENSERS–OIL & GAS ENGINES–METERS–MINING–ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

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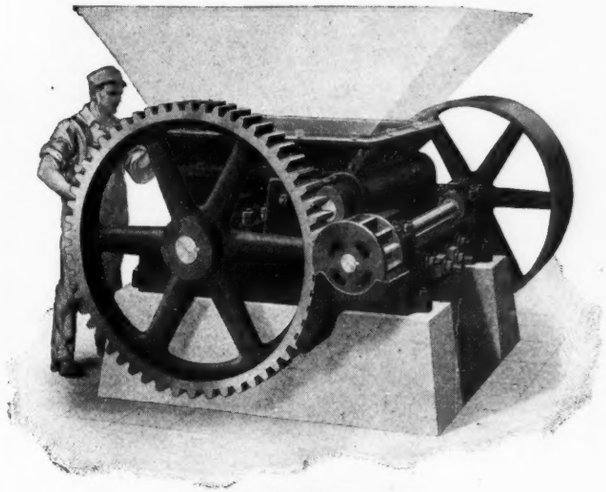
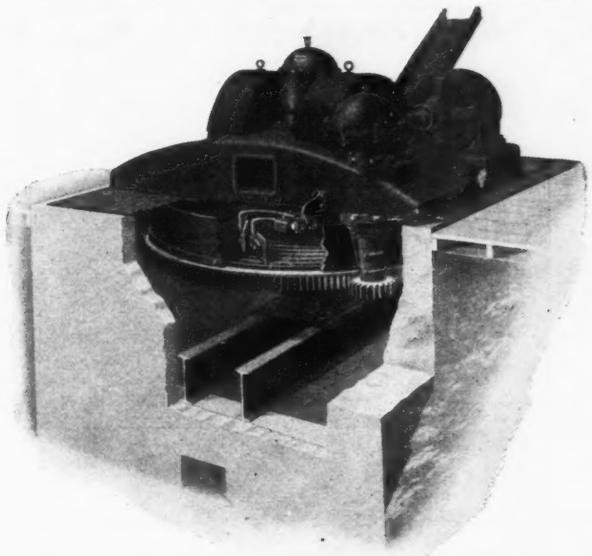
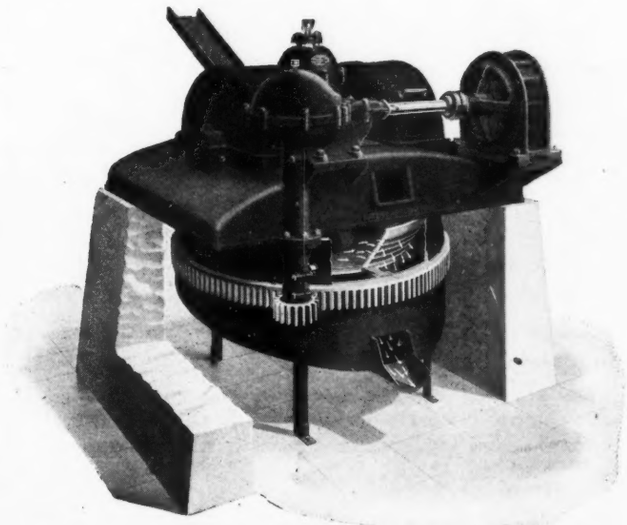
You will get entire satisfaction if you mention ROCK PRODUCTS



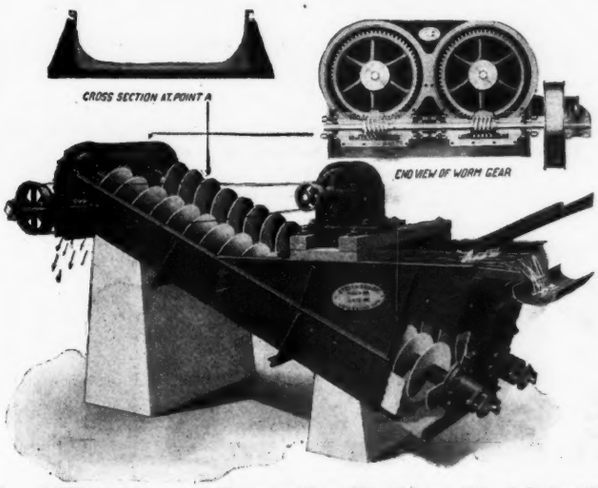
Single Roll Crusher



Model A-300 Step Bearing Type Dry and Semi-Dry Grinding Pan



Sand Grinding and Washing Pan, Model A-302



Sand Washing and Separating Machine, Model A-306

Machines for

Crushing

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Pulverizing

Empounding

Tempering

Mixing and for

Elevating and Conveying all kinds of Materials.

Write for our latest bulletin showing machines of particular interest to you.

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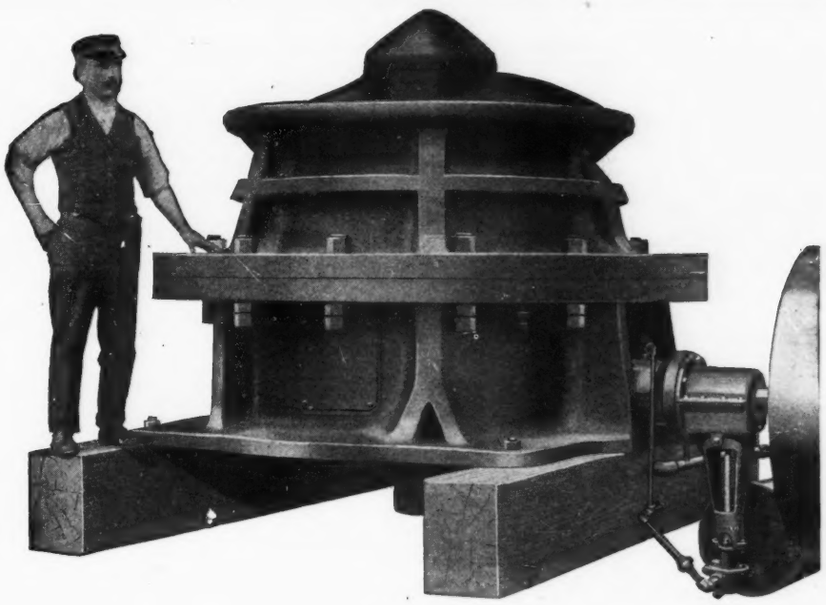
Prompt attention will be given your inquiry if you mention ROCK PRODUCTS



CHECK UP THE TELSMITH REDUCTION CRUSHER

The Telsmith Reduction Crusher embodies all the essentials of the ideal re-crusher. Here are the six principal points:

STRUCTURE—As secondary crushing is very difficult work, a sturdy structure is the first and fundamental requirement. **Note the very short, heavily metalled frame and RIGID SHAFT of the Telsmith Reduction Crusher.**

BEARINGS—For the same reasons, the bearings should be ample in area, well lubricated and thoroughly protected. **The eccentric of the Telsmith Reduction Crusher is almost as long as the crusher itself, with a diameter to correspond. Lubrication is by OIL UNDER PRESSURE.**

FEED AREA—The feed openings should be ample to permit **gravity** flow of rock into the crusher, without hand or mechanical regulation. **Telsmith will work just as well under a 20-foot head of rock as with the bowl barely full.**

DISCHARGE OPENING—The discharge circle must be big enough in diameter to compensate for reduced width of the opening. **In the Telsmith Reduction Crusher the mean discharge diameter is approximately 1 1/2 TIMES the mean feed diameter, allowing free escape of the crushed rock even when set for the smallest product.**

FLY-WHEEL EFFECT—Discharge should be by gravity, since centrifugal discharge involves a dangerous accumulation of fly-wheel effect and serious wear on vital parts of the machine. **Telsmith discharges by gravity through a three-arm bottom spider. The only heavy parts in rotation are the eccentric, gears and driving pulley.**

CRUSHING SURFACES—Wearing surfaces should be ample without any concentration of abrasive action. **Telsmith has an enormous crushing head and concave bowl, with wear uniformly distributed by the "creep" of the head.**

If interested in re-crushers send for our Bulletin No. 4-F-11, covering Telsmith Reduction Crusher. Also glad to send you Catalog No. 166, describing Telsmith Primary Breaker.

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30 Church Street, New York City
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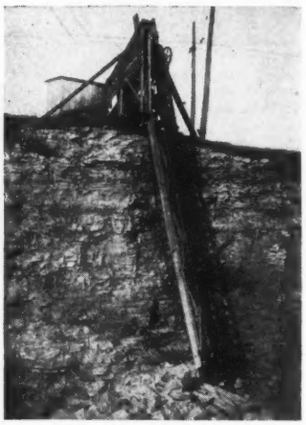
625 Market St., San Francisco, Calif.

Webster Machinery

For Elevating and Conveying in Quarries



Webster Bucket Elevator from Quarry to Cars

And in Sand and Gravel Plants

This company does more than manufacture good machinery.

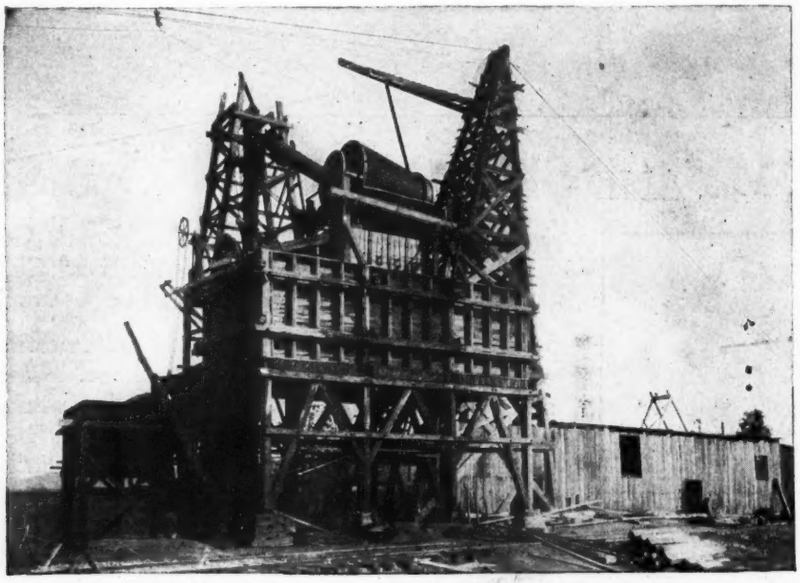
Our engineers render the buyer of Webster Equipment a far reaching service.

The physical conditions of each sand and gravel plant site are studied.

Plants are designed that will do the work required at a minimum cost and in the most effective way.

The same form of service applies to elevating and conveying machinery for cement and chemical plants.

Upon request and without obligation to you Webster Engineers will study your requirements and make recommendations.



(286)

THE WEBSTER M'F'G COMPANY, TIFFIN, OHIO

New York Boston Cincinnati Chicago

Sand and Gravel Plant Machinery, Screens, Conveyors, Feeders, Drives, Friction Clutches, Etc., Etc.

You will get entire satisfaction if you mention ROCK PRODUCTS

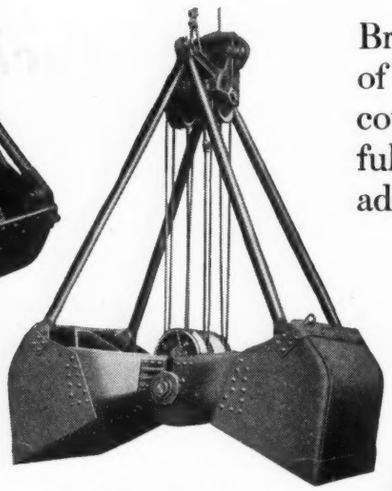
BROWNING

"BUCKETS THAT BITE"

WHEN you buy a bucket, consider these things—Will it bite 100%? Will it stand hard usage? Is it unnecessarily heavy?

Browning Flat Chain Clam Shell Bucket

A quick-detachable bucket of splendid digging power. May be equipped with teeth. A husky, long-lived, hard-duty bucket.

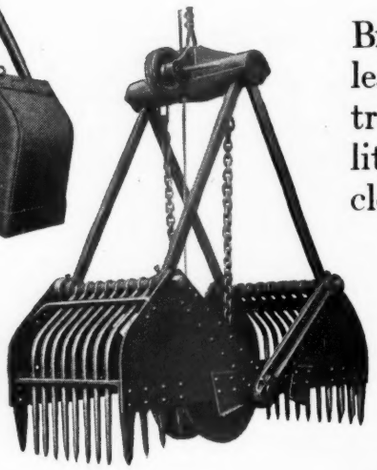


Browning Reeved Type Bucket

The best "trademark" of this bucket is the smooth, clean, flat path which it leaves in its wake—a proof of its ample power and scientifically correct design.

Browning Buckets have won the name of "buckets that bite" solely on account of the fact that they grab the fullest load possible on each trip. In addition to this

Browning Buckets leave a smooth, flat track leaving very little material to be cleaned up by hand.



Browning Coke Fork

Originally designed for use at ovens and blast furnaces, it has proved equally popular for handling straw, manure and garbage.

BROWNING Buckets are so designed that while they are so strong that they will stand years of hard, brutal usage, they are not unnecessarily heavy. Every part is scientifically constructed so that the greatest strength is obtained with the least possible weight. If you are looking for buckets that are built to give 100% service, it will pay you to carefully investigate Browning "Buckets that bite."

There is a Browning Bucket to fill every bucket need. They are described in detail in the Bucket Catalog—it contains information you should have. Your copy is waiting.

Browning Wood Grapple

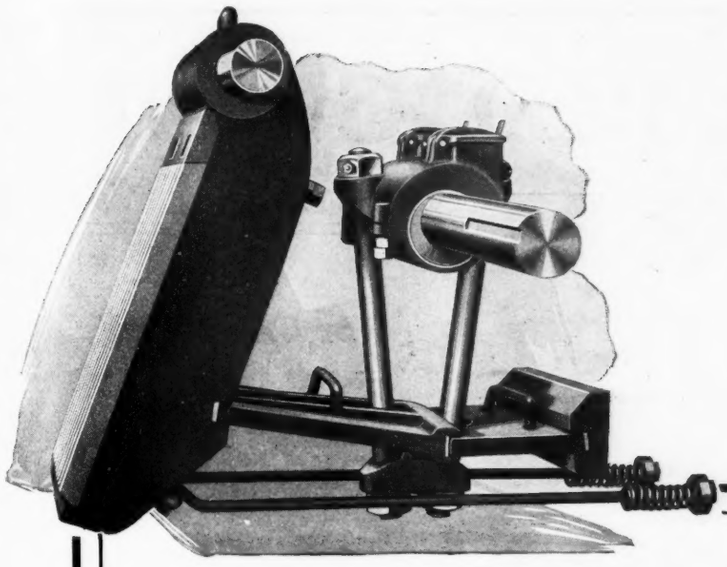
The instant popularity of this grapple in pulp-wood and lumbering districts is ample proof of the efficiency of this new idea in lumber handling.

THE BROWNING COMPANY

CLEVELAND, OHIO, U. S. A.

SALES OFFICES: New York Chicago

Browning Locomotive Cranes "The All-Around Champions"



Getting Down to Brass Tacks

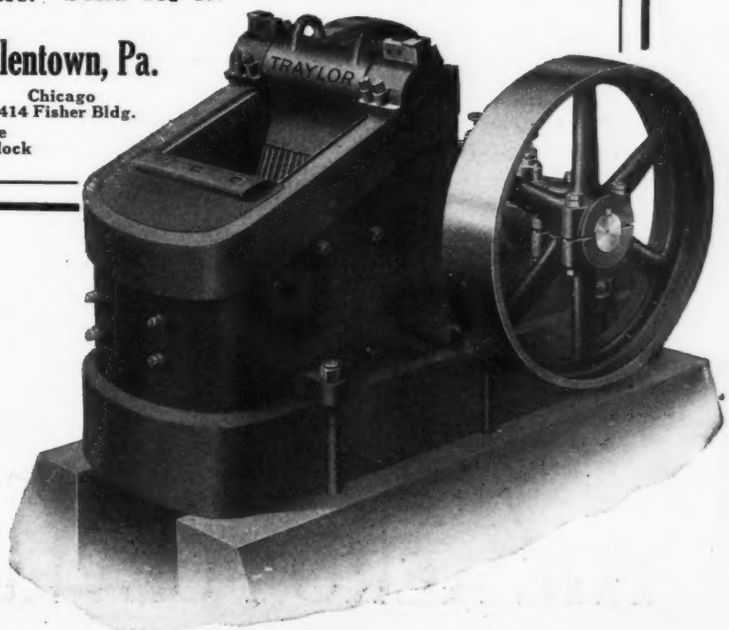
We want you to know what is down inside of the "Bulldog" Jaw Crushers —what it is that eliminates 80 per cent of the friction load of the Blake Type crushers and means big production with lowest operating costs and freedom from breakdowns. Just above are the moving parts of the

Traylor "Bulldog" Jaw Crushers

That pitman, for instance—it's far stronger, lighter and more reliable than a casting ever could be, for those rods are **wrought steel** of known strength. It cuts out all that useless weight of a casting, and puts all of your power into crushing, where it belongs. The Toggle System also—it is self-aligning and exceptionally strong, but above all, it is **frictionless.** Those toggle ends roll on flat steel seats—dust will not make them grind and lubrication is unnecessary. These are only two of the "Bulldog" features that mean greater profits to you. Bulletin P-JX-1 tells of many others. Send for it!

Traylor Engineering & Mfg. Co., Allentown, Pa.

New York 30 Church St. | Pittsburgh 211 Fulton Bldg. | Chicago 1414 Fisher Bldg.
Los Angeles Citizens Bank Bldg. | Spokane Mohawk Block



Rock Products

Vol. XXII Chicago, November 8, 1919 No. 23

If There Is a Shortage of Aggregates Whose Fault Is It?

A STATEMENT, credited to Thomas H. MacDonald, chief of the United States Bureau of Public Roads, to the effect that present producers of mineral aggregates can not begin to supply the requirements of the 1920 highway construction program, is being widely circulated.

Whatever foundation there may be for the statement it is obviously one-sided and was prepared without finding out some fundamental truths. It is circulated as describing universal conditions. It does not. In Wisconsin, for instance, the present producers of mineral aggregates have been able to supply all demands of the federal, state and local highway builders (and they were big demands, too), and through their very effective Mineral Aggregates Association, to give better and prompter service than ever before.

The plight of producers in other states is given in the letter below far better than we can word it.

There undoubtedly are localities where the demand *is* far in excess of the ability of present operators to produce. For the good of the industry we certainly hope that is the case. But it is a false and misleading impression to circulate when applied without qualifications.

Present operators have been handicapped during this season beyond all reason by an utter lack of appreciation on the part of official Washington of the service they can give, will give and have given the public.

The quickest and best way to stimulate the production of mineral aggregates and retain *fair prices* is to give the operators already in the field a little encouragement and *a fair deal.* A subsequent statement of Mr. MacDonald, printed elsewhere, recognizes this.

WE OPERATE TEN MODERN WASHING, SCREENING AND CRUSHING SAND AND GRAVEL PLANTS, located in five different states. Inasmuch as our operation extends from Arkansas to Michigan, conditions and seasons vary.

We believe that generally there is sufficient material in the Central West to supply all the road building aggregates necessary to a consummation of the road-building programs, and that the present capacities of the plants could very likely supply the demands of contractors, providing the orders for material were so distributed throughout the season as to avoid the usual practice of expecting all the material delivered promptly during the last couple of months of the season, and providing also there was a fair distribution of open-top cars.

However, the greatest detriment to the road-building program has been the failure of the Railroad Administration to supply equipment necessary at critical times to move material. I am of the opinion that the order promulgated by the Railroad Administration, recently taking away from our industry all open-top equipment and turning it over to the coal industry, was unwarranted, unprecedented and a serious injustice to other industries depending on this class of equipment. If the present road-building program is to be increased, and the indications are that it will be, I am of the opinion that the most important thing to be done at this time, in order to augment the supply of materials, is to have such legislation as will guarantee to the producers of mineral aggregates stable railway transportation service, which will justify increased investment in the way of larger capacities. This company would be glad to double the capacity of all our plants, providing we would have reasonable assurance of railroad service commensurate with increased capacities.

As it is, the investments that we already have are placed in grave jeopardy because of the power conferred on some regional director to arbitrarily withdraw, without a moment's forewarning, all railroad equipment and service at the very peak of the operating season.

We are therefore of the opinion that the most important thing to be done towards increasing the supply of mineral aggregates is to encourage the increasing of plant capacities by the passage of such legislation as will make impossible future discriminatory orders depriving producers of mineral aggregates of car service at critical periods of the operating season, such as obtained this season.

THE GREENVILLE GRAVEL COMPANY, By Guy C. Baker.

View of crushing plant of the Point Anne Quarries from flux-stone wharf

Large Canadian Quarry Operation with Electric Trolley Locomotives

Point Anne Quarries, Ltd., Finds No Difficulty in Keeping Pole Line in Quarry—Special Setting of Initial Crusher

PROBABLY the average quarryman would say off-hand that the operation of a quarry transportation system by means of electric locomotives with an overhead trolley wire was an impracticable proposition. The Point Anne Quarries, Ltd., of Toronto, Ont., has proved the reverse to be true at its plant at Point Anne, Lake Ontario, which is near Belleville, Ont.

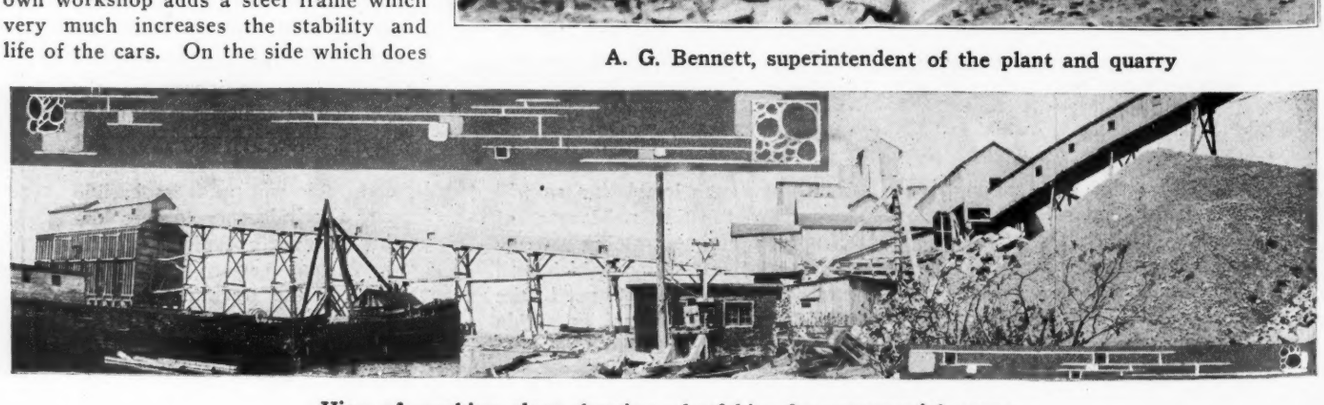
As the accompanying views show, standard-gauge trolley locomotives are used to bring the cars from the quarry to the plant. The locomotives are peculiar in that they are combined with a dump car, there being no waste space. The motorman's cab is little enough. These locomotives handle four or five 6-yd. dump cars in addition to their own load.

The cars are side-dump, but dump on one side only, as the method of operation is such that this is all that is required of them. They are accordingly so much more strongly built, as one of the accompanying views shows. The ordinary side-dump contractor-type car is the starting point, but the company's own workshop adds a steel frame which very much increases the stability and life of the cars. On the side which does not dump, the cars are supported by a steel plate girder instead of being held in place by chains on the opposite side. The car dumps automatically by releasing a catch from the non-dumping side.

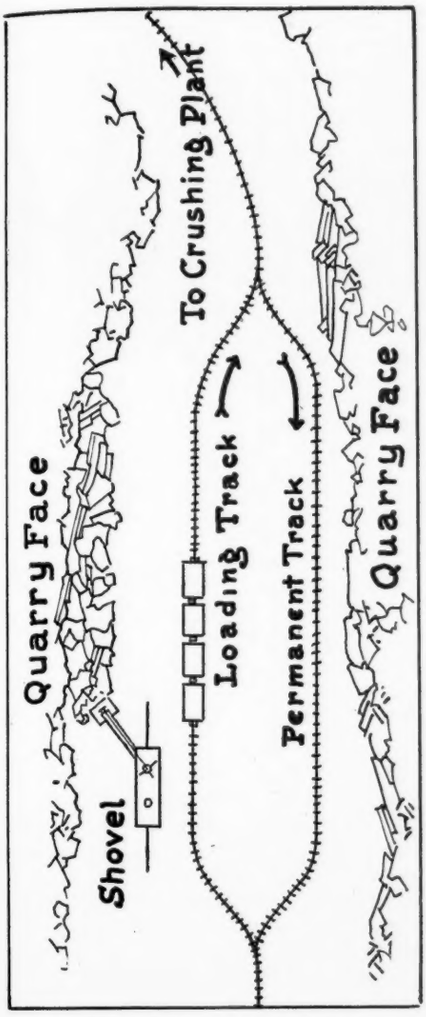
Quarry Operation

The method of operating the quarry, as shown in the accompanying sketch, is very simple. The single track from the plant (1,200 ft. long) is divided at the quarry entrance into two tracks, one of which is permanent, at least for a season, while the other is the temporary loading track. The trains proceed down the permanent track to the switch, with the

A. G. Bennett, superintendent of the plant and quarry



View of crushing plant showing wharf bins for commercial stone



Plan of quarry operation

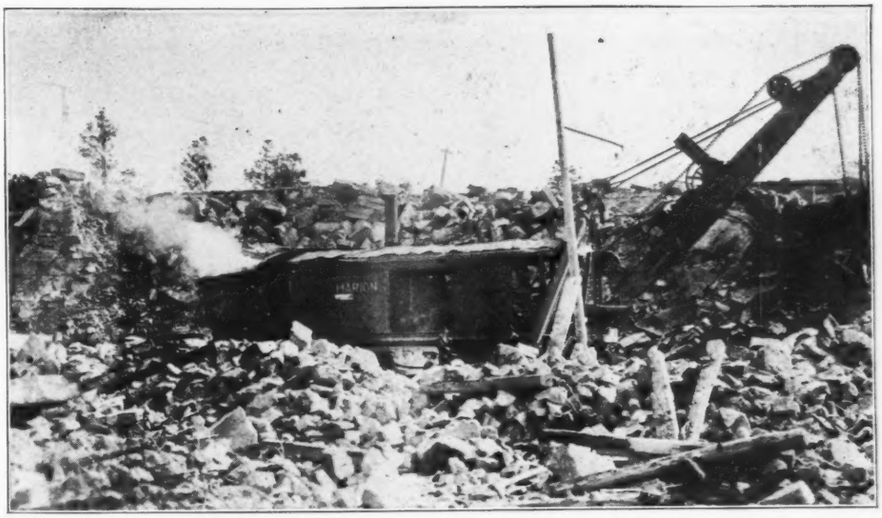
locomotive in the rear, and then come back on the loading track headed toward the plant.

The permanent part of the track system is kept in first-class condition, which permits good speed to be made. No great difficulty is experienced in moving the loading track to keep up to the shovel. It is said a track gang of five or six men can readily shift the pole line in about two hours. Naturally, the poles are not as securely erected as they would be on a "regular" trolley line, but the many loose rocks easily available make it easy to erect the poles rigidly enough for the trolley operation. When blasting, and during the track shifting, the current is, of course, shut off from the trolley wire.

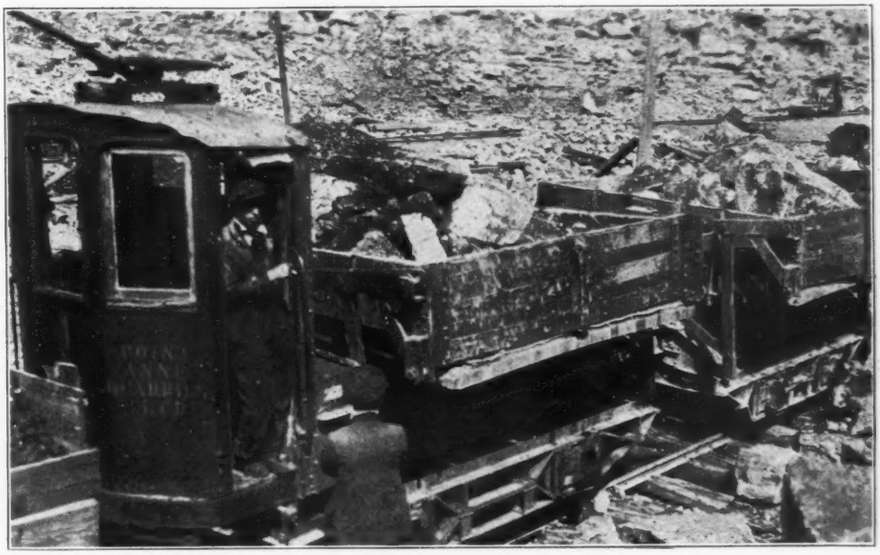
The stone is calcium carbonate—about 96 per cent pure.

Crushing Plant

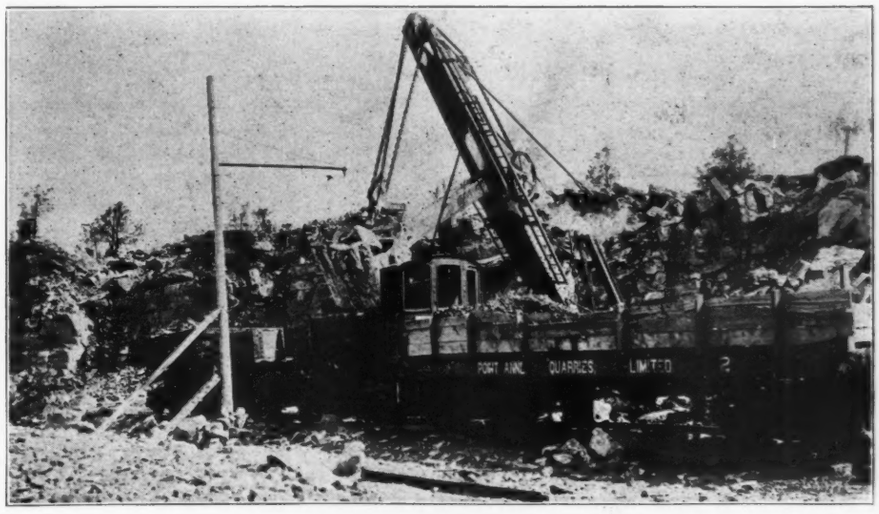
Originally the plant had as an initial crusher a No. 8 gyratory located in the plant proper. The quarry cars were then hauled up an incline and dumped as is the most common practice. When it came to steam-shovel quarry operation and the installation of a larger



Steam shovel working in quarry along side temporary loading track and pole line

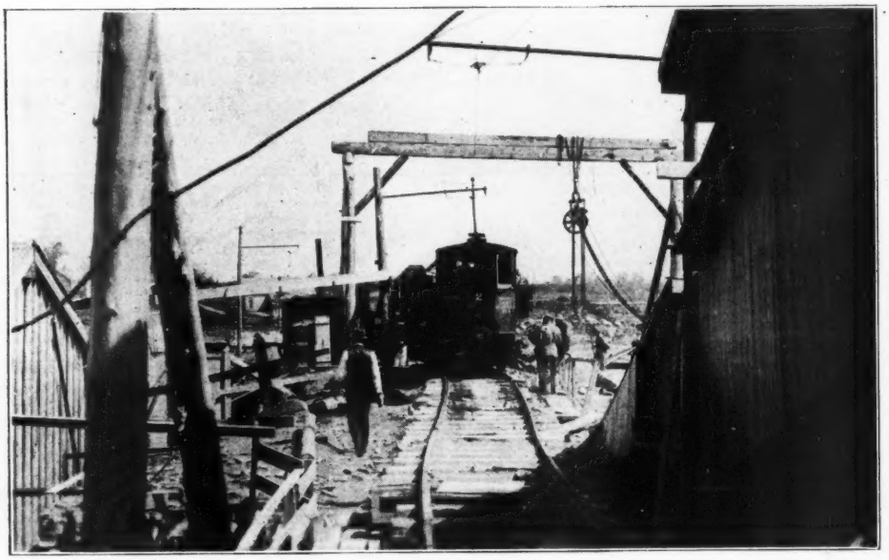


Electric-locomotive and dump-car combined



Locomotive and cars with coal car ahead

Quarry view showing permanent and temporary tracks



Train load dumping at initial crusher

Type of home-reinforced quarry cars

crusher, a layout was devised which did not change the original plant in any way.

In place of the incline a more gently sloping track was built on an embankment from quarry floor level to about the level of the original dumping track. About 100 ft. from the No. 8 crusher down toward the quarry on this track, the new No. 36 crusher was erected on the concrete structure, shown in one of the accompanying views. This crusher is all above the ground level. It discharges to an inclined belt conveyor 130 ft. long, which empties into a 48-in. x 12-ft. scalping screen set at right angles to the belt conveyor.

This scalping screen is erected alongside and above the original No. 8 crusher, so that the rejections drop into this crusher. The largest material which passes the scalping screen goes to a 36-in. belt conveyor over a stock pile about 200 ft. long, which will store about 50,000 tons of stone. Stone from this storage pile is used mostly for blast-furnace flux and is reclaimed through a concrete tunnel under the pile and a 36-in. belt conveyor, completely housed in, extending to a loading wharf in the harbor.

The scalping screen rejections go to the No. 8 crusher, as previously stated, which discharges to an elevator on the side opposite the scalping screen. This elevator also receives any or all the material passing the scalping screen and bypassing the crusher. This material then goes through a 48-in. by 24-ft. sizing screen, and thence either by a long (408 ft.) 36-in. belt conveyor to the wharf bins, or by an elevator to car-loading bins. The car-loading bins are 1,000 tons capacity each and the wharf bins of 3,000 tons capacity each.

Rejection Crushers

The sizing screen rejections go to a No. 6 and a No. 4 gyratory, which discharge to an elevator. This material is sized in a second screen near the first and its product goes by the same elevator to the car bins or by the 36-in. belt conveyor to the wharf. Other belt conveyors make it possible to tap the car bins to feed the wharf conveyor, if desired, or to carry the car bins' overflow to the storage pile.

Probably this plant has more belt conveyors and more storage facilities than the average plant on this side of the line requires. But the severe winter weather in that locality means a long period of shut down, and the demand for the stone as flux and for cement manufacture must be met whenever it is possible to make shipments. Consequently the company carries many thousands of dollars' worth of stored material for a reserve supply.

Electric Operation

The plant is operated entirely by electricity, received by the plant transformer

station at 44,000 volts. For the trolley system a 500-volt direct current is necessary. Besides the plant and two locomotives, two well drills are also driven by electric power, the total power requirement varying from 300 to 400 h. p.

The president of the Point Anne Quarries, Ltd., is M. J. Haney, the manager is J. F. M. Stewart, the secretary-treasurer is A. M. Harnwell and the superintendent at Point Anne is A. G. Bennett.

New Pennsylvania Cement Industry

THE BESSEMER LIMESTONE CEMENT CO., an Ohio corporation formed several months ago at Youngstown, O., will take over the Bessemer Limestone Co., January 1.

A plant to produce 3,000 barrels of cement daily will be built at Hillsville, Penn. Plans are being drawn by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., for the new plant. The company will continue its business in flux stone, agricultural limestone and stone for road building.

The new company will be capitalized at $3,000,000, divided equally between preferred and common. Of this $1,900,000 will be issued at first, $900,000 common and $1,000,000 preferred. The preferred has been underwritten by the Realty Guarantee and Trust Co., of Youngstown, and will be marketed by it.

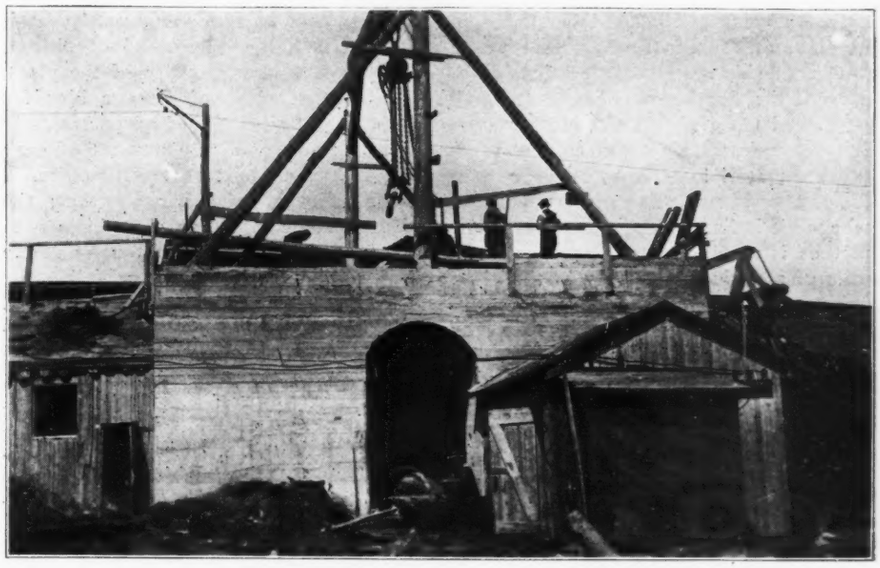
The wet process will be used in manufacturing cement. John Tod is president of the company and J. G. Butler, Jr., is chairman of the board of directors. Fred R. Kanengeiser is vice-president and general manager.

Remarkable Record in Cement Plant Engineering

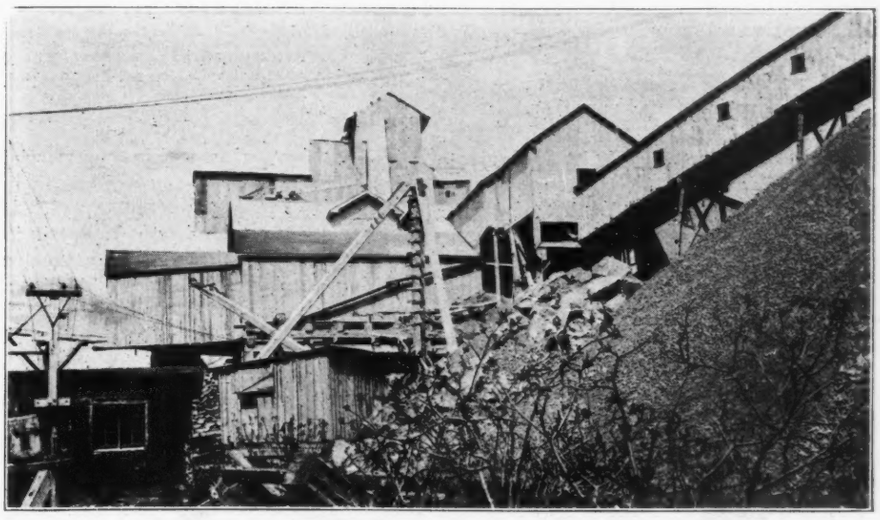
A LIST OF 136 wet-process portland cement plants erected since 1906 has just been issued by the F. L. Smidth & Co., engineers, New York City. Of these 16 are in the United States and Canada —all of these built since 1911. Three were built this year—the Indiana Portland Cement Co. plant near Greencastle, Ind., the Ash Grove Lime & Portland Cement Co. plant, Chanute. Kan., and the Great Western Portland Cement Co, plant at Mildred, Kan.

The other 120 plants are located in Austria, Belgium, Bohemia, British India, Bulgaria, China, Denmark, Finland, France, Germany, Great Britain, Hungary, Italy. Norway, South Africa, Poland, Russia, Roumania, Siam, Siberia, Spain, Sumatra, Sweden, Switzerland and Turkey—certainly as world-wide a practice as any engineering firm can boast of.

No. 36 initial crusher and dumping track



Concrete foundation of initial crusher



Plant view showing conveyor from initial crusher

Design of Large Rock-Crushing Plants

Part VI—Location of Rejections Crushers—Storage Bins—Power—General Conclusions

By Brownell McGrew

TYPES OF CRUSHERS and their particular uses were discussed at length in the first of this series of articles (Rock Products, August 30, pp. 26 and 27), to which the reader is referred in connection with what follows.

Location of Rejections Crushers

Rejections crushers should be located with a view to reducing the height of re-elevation to the separating units to a minimum. The usual method is to take care of this re-elevation with secondary elevators of the belt or chain type. Where the belt conveyor is used as an initial elevator, it is sometimes feasible to use the same type of carrier for a secondary elevator, discharging onto the big belt at the most convenient point. When the skip system of elevation is employed, the final re-crushing units may be placed close to the ground, or even in the main crusher pit, and the re-crushed material chuted or conveyed into the hopper beneath the primary breaker, whence it is handled by the skips. This method is excellent in one way, as it admits of a decided flexibility in the plant arrangement—but, when the amount to be re-elevated is large, its efficiency leaves something to be desired.

In some plants, the whole process of initial crushing, scalping, secondary crushing, primary separation, and re-crushing are performed in the main crusher house, before the stone is sent to the separating and distributing plant. In other plants, the initial breaking is done in one building; the scalping, secondary crushing, primary separation, and re-crushing, in another building; and the final separation and distribution, in a third. A third method is to combine the initial breaking, scalping and secondary breaking in one building; and the separating and re-crushing in another. A variation of the latter is to send the stone back to the secondary units for rejections crushing.

A fourth arrangement is that of doing the primary breaking in one building, and sending the stone into a second building where all the other operations are performed. This arrangement, too, may be varied by placing the rejections crushers in or near the primary crusher house, as mentioned in the first paragraph of this section.

And so on. There is no one arrangement that can be said to be the best under all conditions. The same factors that control the general plant layout will, in general, dictate the proper location of the rejections crushers. Also, a study of the flow sheet will aid the designer in arriving at the most economical disposition of the machines.

Storage Bins

The amount of storage to be provided for will depend entirely upon local conditions, and must, therefore, remain an open question, to be decided by the engineer or operator. Generally speaking, it is desirable to install bins large enough to take care of at least one day's plant capacity. This may or may not be feasible, depending upon ground conditions, and the type and capacity of the plant. The proportioning of storage bins for the different sizes should agree as nearly as practicable with the amount of each size that is to be made. Otherwise, in times of temporary car shortage, the plant may be forced to shut down with one compartment full of stone—and the others considerably less than full.

Bin gates should be made amply large. Nothing is more vexing than the continual plugging of gates that are not large enough for the material. It is also advisable that the larger sizes be operated by power instead of by hand, either air or electricity being satisfactory for this purpose.

It is frequently the case that certain of the grades of product will be shipped mostly, or wholly, in hopper cars; and that other grades will be loaded in gondolas, ballast cars or box cars. If the grades can be so distributed in the bins that all of the loading in one type of car may be done on one track, a considerable amount of car shifting will be eliminated.

Stocking

The subject of stocking commercial sizes has been treated at some length in the columns of Rock Products, and it is unnecessary to take it up in detail in this article. Whether or not extensive stocking equipment is desirable is a question analogous to the one in the preceding section: it must be looked upon with a view to local conditions.

Power

The best drive for the modern large crushing plant is, beyond question, electricity. It is not going too far to say that, without this source of power, combining, as it does, flexibility, reliability and economy, the efficiency attained in many of our largest crushing plants would have been impossible. Preeminent among its advantages over other systems of drive is the flexibility which it permits in the arrangement of the plant machinery. Plants may cover as much territory; may tower as high in the air; or may be sunk as low in the ground, as the designer wishes—without thought of complications, or limitations, of power transmission. The more nearly individualized the various machine drives are made, the more pronounced will be this element of flexibility. It is an especially potent factor in large commercial plants, where it is often desired to cut out different machines temporarily, to effect changes in the output, to reduce capacity, or to make repairs.

That the superiority of the electric drive is clearly recognized among stone operators is reflected in the fact that, in districts where there is no central power station, many of them are installing small steam plants and turbo-generator units to supply their own power.

Alternating-current motors are best adapted to crushing plant work, as their simple and rugged construction makes them less susceptible to dust than the direct-current machines. The squirrel cage type is generally used where the starting torque required is not too high. When the wound-rotor type is installed, the rings and brushes should be encased to protect them from dust.

Whether the centralized, semi-centralized, or individual system of drive is best will depend upon the type of plant. The centralized drive is hardly excusable except on plants of the simplest and most compact character. Personally, the writer is of the opinion that the individual idea should be carried as far as practicable, cutting down to a minimum belts, ropes and countershafting.

It requires a somewhat larger motor to start either the big jaw crusher or the double rolls than is needed to run them under load, unless some auxiliary starting device is employed. This is due to the great weight of the moving parts.

The writer operated one 84x60-in. jaw crusher that was driven by a 200-h. p. squirrel-cage motor. The crushing load on this machine was around 135 k. w., indicating that the size of the motor was ample, so far as this load was concerned. The motor was, however, unable to start the crusher from a dead rest. The reason for this is apparent, as the start-

ing load ran over 300 k. w.—despite the fact that a locomotive was used to break the inertia of the fly-wheels and eccentric shaft and get the big machine under way before the load was thrown on the motor. In cold weather it was sometimes necessary to make three or four attempts, using the locomotive each time, to bring the crusher up to speed. The same difficulty was experienced in the operation of an 84x66-in. jaw crusher, driven by a 200-h. p. rotor-wound motor. In both cases, a 250-h. p. rotor-wound motor would undoubtedly have solved the difficulty.

Temporary Plants

It has been mentioned that among the factors to be considered in crushing plant design is the question of whether or not the plant is intended for permanent operation.

The past few years have seen the erection of several high capacity plants to crush concrete aggregates for the dams built in connection with large hydro-electric, irrigation, and water-storage projects. The usefulness of these plants extends over a very brief period—usually not more than two or three years. Therefore, first cost is a more vital factor in their design than is the case in the construction of permanent plants.

The buildings of these temporary mills are usually constructed of timber; whereas, builders of permanent plants are turning more and more to steel and concrete, in recognition of the ultimate economy that the use of the latter materials entails.

The effort to reduce first cost of the temporary plant will also affect the choice of machinery and its arrangement. The sinking of a pit, wherein to place the main breaker, is generally an expensive operation; hence, the designer will be apt to fight shy of the subterranean initial breaking plant.

The belt conveyor will be apt to suggest itself to him as the best type of elevator, on account of its relatively low first cost, and the light structure needed to carry it. Also, he will be chary of large storage bins, owing to the increased building cost. If the plant is to be driven by electricity, the individual system of drive will probably not be chosen, as the first cost of the centralized or semi-centralized is lower.

And so on, throughout the design. Nevertheless, the idea of saving on first cost can be carried too far, even on a temporary plant; and on no part of the plant is this mistake more apt to be made than in the selection of the primary breaker. The man who holds the purse strings may throw up his hands in horror at the thought of investing in a mammoth crusher for two or three years' service. He may turn to the manufacturer's catalogue and show you where a smaller machine has the rated capacity that he wants. A convincing presentation of the argument under the heading of "Initial Breaking Plant," together with a few figures that anyone, who has tried both the large and small breaker, will be able to give him, will generally effect a change in his viewpoint. Ten cents looks—and is—small. But a saving of ten cents per ton on the operating cost of getting out one million tons of crushed stone, means one hundred thousand dollars—which will purchase a pretty husky crusher, even in these days of unprecedented prices. And second-hand crushers are by no means unmarketable articles.

General

A point that is frequently overlooked in crushing plant design is that of accessibility for repairs and replacements. The importance of this subject can be attested to by a goodly number of plant operators, who have had to tear out part of the building to get at a machine in order to replace some of its parts. Overhead cranes or crawls should be provided, not only over the crushers, but also over the screens and lighter machinery. Proper facilities should be provided for getting the repair parts into the building. An admirable adjunct to the high screen houses of some of our large plants would be a combination freight and passenger elevator. Anyone who has climbed some ten or twelve flights of stairs into the top of one of these skyscraping screen houses will agree with this statement.

Accessibility for inspection and oiling is another highly important feature. Make it easy for the men to get at the machinery, and they will take care of that machinery. Make it hard for them, and the reverse will happen. It is human nature, and must be catered to.

Machinery guards are an essential part of the plant, and should be incorporated in the design. If the men operating the plant know that they are safe they will do better work, and will take better care of the machines. No one cares to oil or inspect a machine if the process involves personal danger. The guards should be constructed that they may be easily removed if it is desired to get at the machine for repairs. Needless to say, all electrical equipment should be thoroughly safeguarded.

The size and elaborateness of the plant will depend upon the extent and variety of the market which that plant is to supply. It is well to allow for expansion. Better to be optimistic, within reasonable limits, than to be sorry afterward.

Design for flexibility—not only of capacity, but of product. Undeniably, there are conditions where the stocking of commercial stone is a necessary and valuable feature. Nevertheless, stocking costs money; and it can be cut to a minimum if the plant is so designed that the product can be adjusted to meet immediate market demands. You cannot avoid making fines—but you can so construct your plant that large or medium sizes, for which there may be no demand at times, can be reduced to, or mixed with, sizes for which there *is* a demand.

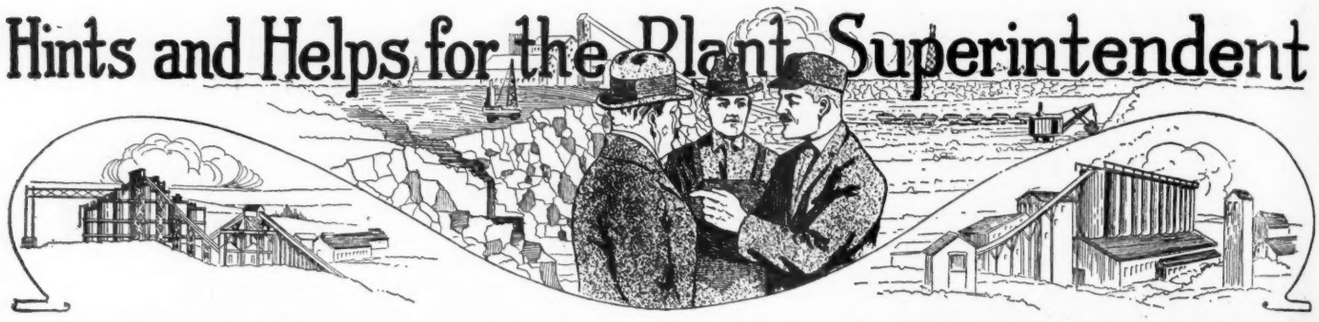
Above all, design the plant to give the market what it wants. Give it clean stone of the proper grade. The day when a multiplicity of sizes could be "drawn from the same box" has passed.

Limestone Screenings Used in Street Paving

A NEW USE for limestone screenings in Chicago is as a cushion course for wood block or brick paving. It is stated that limestone screenings have a greater bonding property than sand.

Wabash Avenue, Chicago, where screenings are used in wood block paving

Hints and Helps for the Plant Superintendent



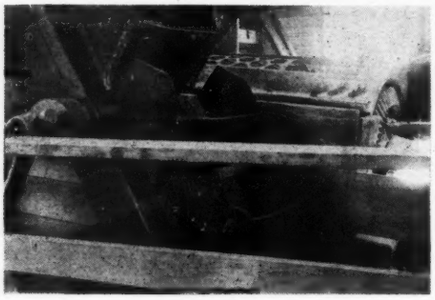
Increases Life of Elevator

STEEL PAN belt elevators are quite generally popular in stone plants of small or average sizes. All operators are, however, bothered with small rocks working in between the belt and the pans. And if they are not promptly removed, they will soon cut a hole through the belt.

Mr. Cochran, superintendent of the Toledo slag plant of the France Slag Co., has devised a method which, in this case, has doubled the life of the elevator belt.

Instead of riveting the pan directly against the belt, a space is maintained between them by small feet. These may be of cast iron or steel and are fastened to the belt and pan by three bolts each. The work of putting in the feet may very easily be done at the plant at a small cost.

Since this method holds the pan a short distance away from the belt it is impossible for small stones to lodge, and so the wear on the belt is removed.

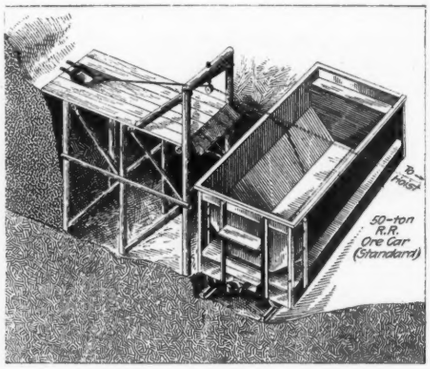


Maintaining space between belt and pan increases life of belt

Loading Cars from Stock Pile

ONE OF THE SIMPLEST possible devices for loading from a stock pile of crushed stone or gravel is that shown in the accompanying illustration, which is taken from an "Engineering and Mining Journal" article describing ore-handling on one of the Minnesota iron ranges.

A small loading platform of 8-in. diameter round posts and 2-in. plank was constructed near the track, which was continued some distance beyond the shaft to permit the spotting of cars. The two uprights on the track side were extended above the top of the platform and connected so that they formed a frame from the center of which was suspended a small block pulley. The platform was about 3 ft. above the top of the cars, but sloped on the outer edge so that the material would run into the cars. An ordinary road scraper was used, fastened to ½-in. cable, passed through the pulley and attached to a small hoist, which was furnished with steam from the boiler house. The far side of the stockpile was removed first. The operation of the scraper required two men. When about half of the pile was moved, the grade became too steep, and it was necessary to provide a small incline to secure the remainder of the material. All material, with the exception of the scraper and the pulley, was in stock at the plant, and the entire rigging was built at slight expense.



Device to load cars from storage

Keeping Drill Holes Clean

ON ACCOUNT of the modern method of firing a large number of drill holes at a single blast, several months may elapse from the time a hole is drilled until it is loaded. If proper precautions are not observed, the hole may become partly filled with debris, which must be cleaned out. A good plan, therefore, is to drive a wooden plug into the hole as soon as it is completed. Where the upper part of the ledge is thin-bedded, loose rock, it may not be possible to plug the holes effectively without casing them for a depth of several feet. Sheet-metal casings may be made at low cost and are highly recommended for use in deposits of this type.

Track Shifter at Steam Shovel

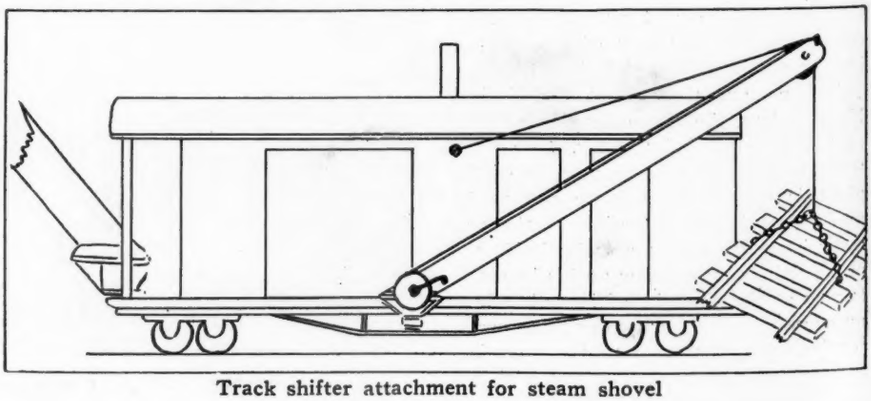
AT THE NORTH BALTIMORE QUARRY of the France Stone Co., A. E. Freeman has a one-man operated tie carrier which shifts the ties and track sections from the rear to the front of the railroad steam shovel.

It is merely a pivot mounted boom at the center of the locomotive, of sufficient length to reach from front to rear of the locomotive.

To operate, the boom is swung about to the rear and the ties are fastened to a cable over the top of the boom. A hand-operated windlass hoists them clear of the ground. One man pushes the boom to the front and the ties are dropped into place.

It is claimed that this device not only saves the time of several men, but that it also reduces the time required to shift the sections.

When the boom is not in use it can easily be pushed out of the way by swinging it around against the locomotive.



Track shifter attachment for steam shovel

An Unusual Crusher Arrangement

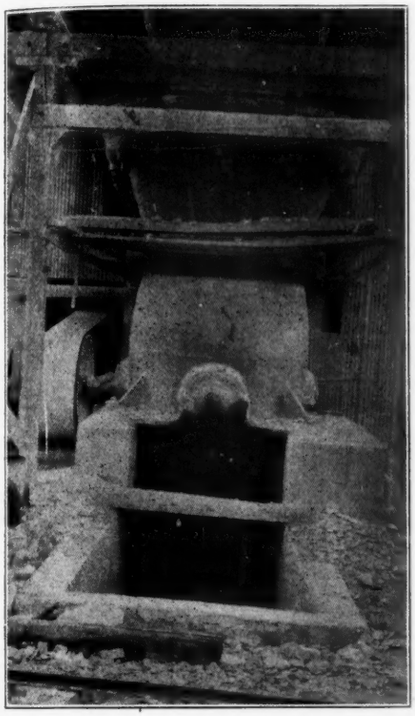
IN A RECENT issue of ROCK PRODUCTS the plant of The Lehigh Stone Co., Kankakee, Ill., was described and at that time it was explained that the company specializes in the production of agricultural limestone. Necessarily this involves quite a crushing problem, which it seems has been solved unusually well.

As far as was possible the crushers were grouped; the five No. 6 secondary crushers are mounted on one massive reinforced concrete footing immediately below the scalping screen. This not only gives an automatic control of proportioning the feed to the crushers but also gives a unified drive. Two 100 h.p. motors drive line shafts on either side of the group and a friction clutch controls the drive. It is possible to cut out one crusher and repair it while the others are running.

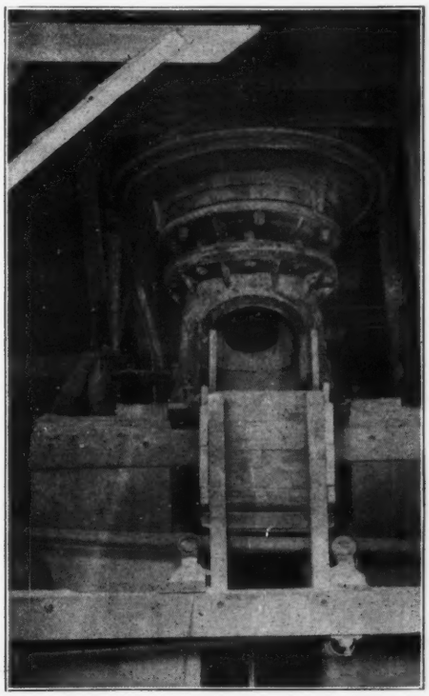
The crushed stone from the crushers is fed onto a belt conveyor by means of box hoppers shown in one view and the united product of all crushers is fed to an elevator.

A large roll crusher is provided for the last stage of the reduction. It is so situated and a belt feed provided that stone may be fed to it from the 1½-in. size loading bin. It will reduce material from 1½-in. to 10 mesh.

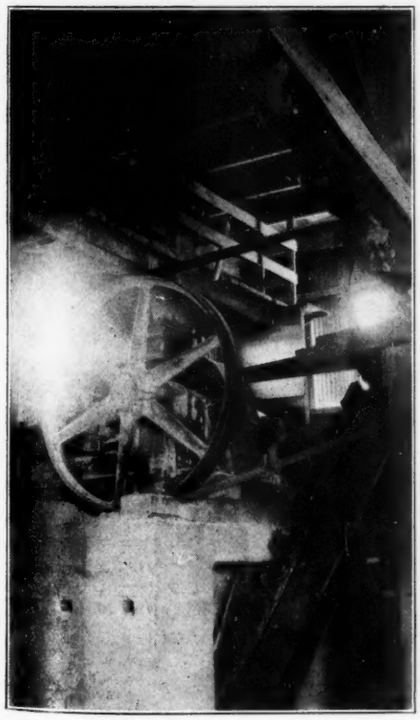
Provisions are made for returning an excess of sizes over 1½-in. to the battery of secondaries so that they may be reduced to be handled by the roll.



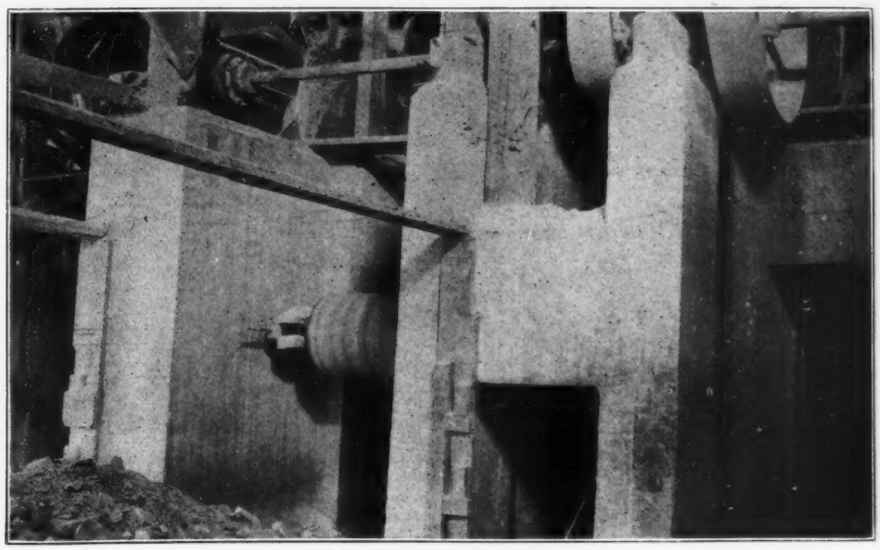
No. 36 gyratory, belt drive and deposits directly to elevator



Views of secondaries showing how crushed product is delivered to belt and then to elevator



Roll crusher for final crushing



Concrete footing for secondaries showing one drive shaft

Trip of the Illinois Highway Officials to Chicago District Gravel Plants

Illinois Highway Officials and Chicago Sand and Gravel Producers Get Together on Inspection Trip to Find Out How Aggregates May Be Best Produced

REALIZING that it would be of mutual benefit, the Chicago Sand and Gravel Producers Association invited representatives of the Illinois State Highway Commission and the Northern County Highway Engineers to spend three days of last week on an inspection tour of the Chicago district sand and gravel plants.

It was proposed that the trip should be made by automobiles, but owing to the considerable rainfall the plans had to be somewhat altered to avoid the soft roads. In spite of the rainfall, the spirits of the company were not dampened, and the results were even better than were hoped for.

The Illinois Highway Commission was represented by Clifford Older, Chief Engineer, and F. L. Roman, Testing Engineer. C. P. Ernst, Assistant Chief Engineer, Cook County; Mr. Carter and Mr. Lindsey, Engineers of Winnebago County, were also in the party. C. M. Powell, Chief Engineer of the Portland Cement Association, made part of the trip.

Plans were made for the trip by Ben Stone, Business Executive of the Association; R. P. Duffy, of the Richardson Sand Co., and G. P. Longwell, Chairman of the Executive Committee of the Association. The Chicago district producers who made the trip, or at least spent one day with the party, were A. Y. Reed, of the A. Y. Reed Gravel Co.; G. A. Rubin and A. A. Rotstein, of the Beloit Sand and Gravel Co.; S. A. Gibson, of the Rockford Sand Co., and Mr. Lindsay, of the Producers Material Co.

Purpose of Trip

The purpose of the trip was to show the highway engineers just what material the Chicago producers had for road building, and their method and capacity for producing such. On the other hand, the engineers were at liberty to criticize the methods in order that the producers might learn first hand just what the requirements are and how they may be best met.

Itinerary

On Wednesday morning the party started from Chicago and proceeded to

Illinois highway officials and Chicago district producers on inspection trip

Elgin, Ill., where automobiles were procured and the Algonquin, Ill., pits were visited. These were the Reinart Sand and Gravel Co., the Aetna Sand and Gravel Co., and the Lakeshore Sand and Gravel Co. Since these plants are all very close together and have practically the same material to work with, they are quite similar, and each has a daily capacity of some 40 to 50 cars.

In the afternoon the American Sand and Gravel Co., the Richardson Sand Co., at Carpentersville, and the A. Y. Reed Gravel Co., at Elgin, were visited. The night was spent in Rockford, Ill.

On Thursday the Rockford Sand Co., Rockford; the Beloit Sand and Gravel Co., Riton, Wis.; the Carrico Stone Co., Beloit, Wis.; the Federal Sand and Gravel Co., the Attwood-Davis Sand and Gravel Co., the Wilcox Sand and Gravel Co., and the Janesville Sand and Gravel Co., all of Janesville, Wis., were visited.

Friday the Coleman plant of the Richardson Sand Co., and the Spaulding Sand and Gravel Co. were visited.

Points of Interest

The trip was of interest and benefit to both engineers and producers in that the different methods of each man were brought to notice. One of the conspicuous points of the observation was the presentation of the originality of the different men.

The engineers were particularly interested in the gravel banks, what per cent of sand and gravel it would run, the screening arrangements and what material could be produced, the water supply, and whether the material was washed clean, and the method of mixing road material and loading. It was found that the banks ran 30 to 75 per cent gravel.

In all cases the impression was very good, the only criticisms being that in some cases more water would improve material and that a better method of mixing aggregates must be obtained.

Grading Aggregate

The Illinois specification is very wide in that it allows 30 to 70 per cent less than 1 in. The big point that Mr. Older made with the reference to grading of aggregates is that it must be uniform. In proportioning the mix of concrete it is essential that each patch have the same amount of the various sizes.

At present the general practice in making road material is to separate it in various sizes by two or three screens, sending each size to a separate storage bin. When road material is ordered, the sizes are mixed as the car is filled.

Mr. Older objects to this practice for the following reasons: Where two separate spouts are used, the car will be so loaded that at each end there will be a pocket of either coarse or fine material. Where one spout is used, the material is not sufficiently mixed, and the large stones, because of their added inertia, fly to the outside of the car and leave a heap of fine material in the center. It was proposed that when an order for road material is received that instead of storing sizes in several separate bins that chutes be provided from the sizing screens so that the gravel will all fall into one bin in one stream. Thus a first mixture will be obtained as the material goes to the bin. In loading cars a further mix will be afforded by the material coming out of one chute. If there is still a tendency for the large sizes to run to the outside of the car it is proposed that a hinge baffle be put on the end of the chute so that material will fall straight down into the car. It is believed with these methods of handling aggregates at the plant a uniform mix will be delivered to the job.

Road Building Program

The road-building program for next year will be limited only by the supply of material and labor and the ability of the contractors to handle work.

A plan is now under consideration to allow contractor an advance of 75 per cent of the cost of the material so that he may buy material over the entire producing season and have an adequate reserve to carry him over a car shortage period. With a supply on hand to the extent of from 25 to 50 per cent of the aggregate required when the job is started, completion should be possible without interruption. This will be of benefit to both producer and contractor, for it will give a season-long demand and will lessen the rush season.

With the completion of the road program proposed for next year, Illinois producers will have their greatest year of production in history. Contracts let and work incomplete to be carried over to next year will amount to 500 miles of road, or about 2,500,000 tons of aggregate. At present it is proposed to design and let before the beginning of next year's construction at least twice this amount, which will make next year's road building amount to 1,500 miles.

The mileage is about evenly distributed over the entire State, but the Illinois aggregate is mostly in the northern part of the State. At present the real proposition confronting the Illinois Highway Department is to find material for 400 mi. of road south of St. Louis.

There are only two or three sand and gravel and stone producers in this district or, close enough to reach this district with reasonable freight rates.

Although there is but little sand and gravel in southern Illinois, it is stated that there is stone. In event that the required material for road building cannot be obtained in any other way the state will probably have to erect a crushing plant of its own. If possible it would be more desirable for an already established producer to enter this territory and put up a plant. The present road building alone would give a ten-years' demand, according to Mr. Older.

On Friday night the trip was unanimously pronounced a success, for each party not only learned the others' difficulties to be overcome, but there was a general impression that there is considerable goodfellowship among those working to make next year's Illinois road-building program the biggest and most successful ever.

Sutton's Washington Trip Big Help to Producers of Aggregates

E. GUY SUTTON, business manager of the National Association of Sand and Gravel Producers, who camped on the trail of Railroad Administration officials continuously from the time the order giving coal mines preferential treatment in the matter of car supply was issued, until it was withdrawn, has reported as follows:

"In my efforts at Washington to secure relief in the matter of car supply I submitted a letter to the Car Service Section, setting forth the discriminatory and disastrous effect brought about by the curtailment of shipments of sand and gravel, and insisted that action be taken to accord with the following suggestions:

"1. The issuance of instructions to Regional Directors previous to November 1, directing that open-top cars in excess of the actual requirements of the coal mines be furnished for the loading of sand, gravel, stone and slag.

"2. That after November 1 preferential movement be accorded sand, gravel, stone and slag, so that construction could proceed with maximum speed.

"The first suggestion was incorporated in an order which was sent out by the Car Service Section on October 29, which charged the Regional Directors to resume immediately the normal distribution of open-top cars between all commodities to the greatest extent possible under the circumstances.

"However, it was thought inexpedient to grant preferential movement to mineral aggregates at this time, though positive assurance was given that every endeavor would be made to compensate for the restriction of transportation privileges which our industry suffered during the ten days previous to Nov. 1.

"I have made special arrangements with Mr. Gutheim, of the Car Service Section, whereby he will give consideration to specific cases where available cars are not being provided.

Specifications for Sand and Gravel

Third Article—Gravel for Railway Ballast—Foundry Sand—Engine Sand—Filter Sand and Gravel—Grinding Sand

SAND FOR VARIOUS CONSTRUCTION WORK was described in two previous articles. This article deals with the other principal uses of sand and gravel.

Gravel for Railroad Ballast

While there is considerable dispute as to the comparative value of gravel and crushed rock, the former, where it is properly handled, is coming to be very generally regarded as an excellent ballast material.

In general, gravels to give the best results when used as ballast should be angular, for angularity causes the gravel to bind better, to roll less, and to make the road bed less mobile. Unfortunately very little angular gravel is found in the many deposits.

Graded gravel is best for ballast, because there is a smaller proportion of voids, the individual pebbles are in contact at a larger number of points, and the mass is less mobile. For these reasons, a certain amount of sand should be present in a gravel ballast.

Clay or loam, technically known as dust, is undesirable in gravel for railroad ballast, because it gives a soil for the growth of weeds on the track; disturbs drainage, with resultant decay of ties; and makes a dusty right-of-way.

The report of the Committee on Ballasting of the American Railway Engineering and Maintenance of Way Association makes the following statements and recommendations:[1]

1. Gravel with much over 3 per cent of dust does not drain freely; with less than that amount drainage is good.
2. Gravel with less than 2 per cent dust makes a fairly dustless road bed.
3. Pebbles should not exceed 2 inches in size. Larger pebbles should be crushed and returned to the ballast.
4. Less than 20 per cent sand permits pebbles to shift, under load, and over 50 per cent prevents ballast from becoming firm.
5. The Committee recommends for

Class "A" roads, 10 parts gravel and 3 parts sand. Bank gravel with over 2 per cent dust or 40 per cent sand should be washed and screened.

Class "B" roads, 10 parts of gravel and 6 parts sand. Bank gravel with over 3 per cent dust or 60 per cent sand should be screened or washed.

Class "C" roads, 10 parts gravel and 10 parts sand. Any gravel not over 6 per cent dust may be used.

The foregoing classes refer to the amount of traffic handled, and are defined in the manual of the American Railway Engineers' Association.

Foundry Sand

The following description of the properties of molding sands is condensed directly from the detailed report by Ries and Rosen.[1] Under the term foundry sand there is included (a) sands for making the mold itself into which the metal is poured, and (b) core sand for the cores which fill the hollow spaces in the casting. In general, molding sands are finer and more loamy than core sands, the latter being low in natural bond. For large castings, a coarse porous sand is needed to allow of proper steam escape, while the smooth surface of smaller and finer castings demands a finer sand. For steel castings a very refractory sand is needed to resist the necessarily high temperature, and sands lower than 97 per cent of silica are seldom used. For other castings, 70 to 80 per cent of silica is usually sufficient.

Briefly stated, the requisites of a good foundry sand are cohesiveness, refractoriness, suitable texture, porosity and permeability, and durability. These properties may well be examined more closely.

1. *Cohesiveness*—The sand, when slightly moistened, or tempered as it is called, must cohere sufficiently to form a mold. This property is due to the presence of a small amount of clay in the sand. Core sands in which the binder must be destroyed by the heating process, in order that the core may be easily removed from the hollow space, usually demands an artificial binder, that will burn out, leaving the sand loose, after the casting is complete. Neither chemical nor mechanical analyses seem to throw much light on this property. Some low alumina sands are very cohesive, while others with a much higher content of alumina are only slightly cohesive.

2. *Refractoriness* — Sands should be sufficiently refractory that upon casting, the surface of the mold is not fused. This is imperative, since for the escape of the steam formed, the sand must remain porous, and fusion destroys this porosity. For steel casting, where extremely high temperatures are encountered, a highly refractory sand is demanded. Since silica is the commonest refractory substance, very pure silica sands are used, running 97 per cent or more. For casting iron and other metals, where the temperatures are lower, the sands need not be so refractory, and lower silica content is allowable, down to 80 or even 70 per cent. A very high percentage of fines usually indicates a less refractory sand, since most of the clay particles are in the fines, and the clay carries the fluxing substances. The fluxes are iron oxide, lime, magnesia, and the alkalies. Lime by itself is highly refractory, and is sometimes used as a fire-wall lining between the metal and the sand. This does not, however, invalidate the conclusion that lime fluxes silica, and hence lowers the refractoriness of molding sands, when intimately mixed with them.

Although chemical analysis is by no means a sure test of refractoriness, a very high silica content (97 per cent or more) almost certainly indicates a very refractory sand, while high iron, lime, magnesia, or alkalies indicates a sand whose refractoriness is low. No exact data are available to show relation of quantity of fluxes to temperature of fusion. The relation does not appear to be a direct one. Other factors being equal, a fine-grained sand is less refractory than a coarse one.

3. *Texture*—This is highly important in a molding sand, because it effects closely the permeability and determines the grade of casting for which sand is suited. There are several methods for determining the texture, all of them based on a separation of the sand into various sizes.

4. *Porosity and Permeability*—These properties, while closely related, are quite distinct. Porosity is the percentage of empty space or voids between the grains. Permeability is the property by virtue of which liquids or gases filter through it. Large amount of pore space, if the pores are individually very small, may yield a very slight permeability, while a relatively low porosity, if the pores are large and continuous, may give a highly permeable sand.

Permeability is to be desired, since it is necessary to allow the escape of steam during pouring; otherwise, the steam forms blow holes and damages the casting. Permeability is sometimes determined by the aspirator. Porosity alone can not be used as an indication of permeability, though coarse texture and high porosity combined usually indicate it to a fair degree. A sand, the refractoriness of which is low even though originally permeable, may fuse and close the pores.

5. *Durability*—Perhaps owing to the dehydrating of clay particles, sand burns out, with consequent loss of adhesiveness. Fusion may also cause adhesion of grains and coarsening of texture. Some sands lose their value after being once used, while others can be used sev-

[1] Engineering News, April 15, 1909.

[1] Ann. Report., Michigan Geol. Survey, 1907, passim.

eral times. Durability is a property which can be determined only by use.

The following are specifications for steel molding sand used on the Isthmus by the Panama Canal Commission:[1]

Sand, silica, to be sharp, free from loam and other organic matter, and suitable for steel castings, shall show the following upon analysis:

ANALYSIS OF SAND SUITED FOR STEEL CASTING

SiO_2	95-100 per cent.
Fe_2O_3	Under 1 per cent
CaO	Under 1 per cent
MgO	Under 1 per cent

H. E. Field[2] gives the following characterization of a good molding sand for ordinary castings:

It is very necessary that a sand be chosen with a low percentage of strong bond rather than a large percentage of weak bond. . . . . The strength of a molding sand determines its adaptability for different kinds of work. . . . . The strength of sand depends upon three conditions: First, the proportion of bond; second, the strength of the bond; and third, the shape of the quartz silica particles.

He gives the following as a desirable chemical composition:

THEORETICAL COMPOSITION DESIRABLE FOR MOLDING SAND

Silica	75-85 per cent
Alumina	7-10 per cent
Lime below	2 per cent
Oxides from iron below	6 per cent
Alkalies below	½ per cent

Several special varieties of foundry sand are defined in the following paragraphs:

Brass sand is a very fine sand for making molds for aluminum, brass, and bronze castings. It has a strong bond, but, owing to its extreme fineness, is only slightly permeable. It must be used with great care to prevent "blowing."

Facing sand is a fine sand used for facing certain molds, where a smooth finish is desired on a heavy casting which demands a mold of coarse sand. It is simply a fine grade of molding sand, and would for lighter work be perfectly fitted for the whole mold.

French sand is a fine, open, sharp, yellow sand imported from France for brass and bronze casting.

Parting sand is a fine, non-cohesive sand, free from clay, and is used to dust the meeting faces of the parts of a mold to prevent sticking. Brick molds are also dusted to facilitate the removal of the form from the mold.

Engine Sand

Owing to vegetation on the railroad tracks, the consumption of this sand is larger in the spring and early summer than in other seasons. In winter slippery tracks would naturally cause heavy demand, but the feeding pipes clog with snow at the bottom and prevent the ready use of sand. According to Condra,[1] a good engine sand should have the characteristics of dryness, coarseness, sharpness, and hardness. It must be dry. Since it is carried in the sand dome of the engine, and fed to the rails through tubes, the sand must be thoroughly dry to prevent clogging in the feeding tubes. Practically never is sand secured sufficiently dry for the purpose.

The sand should be sufficiently coarse to remain on the rail in a moderately strong wind, but it should be free from sticks or coarse pebbles that will clog the feeders. Coarse material is usually screened out. Specifications often call for a sharp sand, but as angular fragments are produced by crushing as soon as the wheel passes over the sand, it is quite probable that sharpness is not particularly essential. The grains should consist of some material sufficiently hard not to be entirely crushed to a powder on being used. For that reason, quartz or flint sands are desirable.

Filter Sand and Gravel

The specifications for the filtration plant at Washington, D. C., which called for proposals for furnishing 140,200 cu. yd. of filter sand and 42,300 cu. yd. of filter gravel, were as follows:

Filter Gravel—On the floor of the filters and surrounding the under-drains shall be placed gravel or broken stone having a maximum depth of 1 ft. Instructions will be given by the Engineer officer in charge as to the exact arrangement and positions of the various layers when the stone commences to be received upon the ground, but the arrangement will be approximately as follows: The lower 7 in. shall consist of broken stone or gravel which will remain upon a screen with a mesh of 1 in., and which has but very few stones over 2 in. in diameter. Above this shall be placed 2½ in. of broken stone or gravel which has passed a screen with a mesh of 1 in., and which remains upon a screen with a clear mesh of ¾ in. Above this shall be placed 2½ in. of broken stone or gravel, which has passed a screen with a mesh of ¾ in., and which is coarser than the ordinary sand, and entirely free from fine material.

The material for all of the layers may be broken trap rock or granite screened to the proper sizes, or gravel screened from sand and gravel banks of a sandy nature. Gravel screened from hardpan or clayey material can not be sufficiently cleaned. The gravel shall not contain more than a very small amount of shale or limestone. The gravel shall be washed entirely free from fine material, so that water passing through it or agitated in contact with it will remain substantially clean.

Filter Sand—The filter sand shall be clean river, beach, or bank sand, with either sharp or rounded grains. It shall be entirely free from clay, dust, or organic impurities and shall, if necessary, be washed to remove such materials from it. The grains shall, all of them, be of hard material which will not disintegrate and shall be of the following diameters: Not more than one-half of 1 per cent by weight shall be less 0.13 millimeter; not more than 8 per cent less than 0.26 millimeter. At least 7 per cent by weight shall be less than 0.34 millimeter, at least 70 per cent less than 0.83 and at least 90 per cent less than 2.1 millimeters. No particle shall be more than 5 millimeters in diameter, and the sand shall be passed through screens or sieves of such mesh as to stop all such particles, and no screen or sieve shall be used containing at any point holes or passages allowing grains larger than the above to pass. The diameters of the sand grains will be computed as the diameters of spheres of equal volumes. The sand shall not contain more than 2 per cent by weight of lime and magnesia taken together and calculated as carbonates. In all other respects the sand shall be of a quality satisfactory to the Engineer officer in charge.

The filter sand shall be placed in the filters in three layers, each layer to be about 1 ft. thick, and the sand shall not be dropped from a height into final position or otherwise unduly compacted. The first two layers may be filled in to only approximate depths and the surfaces need not be smoothed. The final layer shall be brought to a true and even grade, and the surface left smooth and uniform.

The specifications for the plants at Springfield, Mass., and Toronto, are practically identical, as follows:

The filter sand shall be clean sand, with either sharp or rounded grains. It shall be entirely free from clay, dust, or organic impurities, and shall, if necessary, be washed to remove such materials from it. The grains shall, all of them, be of hard material which will not disintegrate. The effective size shall not be less than 0.25 millimeter nor more than 0.35 millimeter. The uniformity coefficient shall not be more than 3.0. The sand shall be free from dust and shall not contain more than 1 per cent finer than 0.13 millimeter, and shall be entirely free from particles over 5 millimeters in diameter. The sand shall not contain more than 2 per cent by weight of lime and magnesia taken together as carbonates. In all other respects the sand shall be of a quality satisfactory to the engineer.

Glass Sand

Glass sand includes, properly speaking, only the sand used in the batch. Technically, it is known as melting sand. The sand used for grinding and polishing is listed under the name of grinding and polishing sand.

The essential properties of a good glass sand are somewhat variously given by different authorities. This subject was covered quite completely in Rock Products, October 25, 1919, pp. 29-30.

Grinding and Polishing Sand

For polishing glass a very hard sand is necessary, from which all coarse particles have been removed by screening. At those plants which wash their melting sand, the washings or slimes are usually run into the grinding sand. The latter is then screened to remove any large fragments that might scratch the surface of the glass. Quartz sand is used exclusively.

Stone Sawer's Sand

Sand for stone-sawing purposes demands a sand that is unusually hard and sharp.

Sand for Sand-Blast Work

Sand for sand-blast work should be moderately coarse, hard, and preferably sharp.

Fire and Furnace Sand

Fire sand and furnace sand are synonymous terms. It is used with either lime or fire clay binder, for lining and patching furnaces, cupolas, converters, and ladles to contain molten metal. It is used also for runners for making pig iron castings.

For the better classes of work a very pure silica sand, in which the amount of fluxing matter runs low, is used. No

[1] Stone, R. W., Sand and gravel; Mineral resources of United States for 1913, pt. 2, p. 334.
[2] Iron Trade Review, p. 19, Mar. 15, 1906.

[1] Condra, G. E., Sand and gravel resources and industries of Nebraska, Nebraska Geol. Survey, vol. 3, pt. 1, pp. 186-190, 1908.

quantitative data are at hand, but it is to be assumed that it should at least be as refractory as a good grade of steel sand.

COMPOSITION OF AVERAGE STEEL SAND

SiO_2	95 to 100 per cent
Fe_2O_3	less than one per cent
CaO	less than one per cent
MgO	less than one per cent

Bedding Sand

A small quantity of sand is used for bedding stock cars. The sand should be free from large pebbles, and sufficiently free from clay that it will drain properly and not puddle with stable moisture.

Minor Uses for Sand

Other less important uses for sand are numerous. In certain localities, considerable quantities are used in sanding the surface of freshly painted fences, stations, and other buildings. The chief purpose is protection from the carving and writing usually seen in public places. Sand is also used for sand-paper. Very fine sand is used as the base of certain scouring soaps, as glaze on pottery, for strikers on match boxes, and for filler in the manufacture of paper.

Texas Sand and Gravel Plant Managed and Operated by a Woman

Suction Dredge Pumps Material to Screens and Bins on Shore—Crude-Oil Engine-Driven Pumps

Dredge, showing method of working pan

THE URBANA GRAVEL CO., of Urbana, Texas, situated on the Houston, East and West Texas R. R., sixty miles northeast of Houston, was chartered in 1908 by C. R. Cummings and associates. Since the death of Mr. Cummings in 1917 the company has been managed by his daughter, Miss Hazel J. Cummings.

The deposit of gravel and sand which is being worked is alluvial, and was presumably the old bed of the Trinity River, now one mile distant. It covers approximately one hundred acres in area, with a mean depth of 32 ft.; 20 ft. above water and 12 ft. below, to a sandstone bottom.

After several experimental plants had been tried, the present system was decided upon in 1913, and is still in operation. The pit is semicircular in shape, and operated by a dredge, with separating plant, sand bins, and railroad tracks in the center.

Floating Dredge

The floating dredge is equipped with an 8-in. centrifugal pump operated by a 60-h. p. crude oil engine. This dredge makes a semicircular cut of 40 ft. in width each trip around the bank by increasing length of pipe. The suction is an open 8-in. pipe 14-ft. long and is lowered and raised to the desired depth by a friction clutch.

As the material is loosely packed, free from clay and over burden, no mechanical cutter is necessary. The bank above water level is washed and caved down to the mouth of suction by a small force pump throwing a 1-in. stream of water. The discharge of the 8-in. pump is through an 8-in. pipe line with flexible joints giving it the necessary elasticity in case of heavy cave or high wind. This pipe line is carried on pontoons to the separating and screening plant.

Screening Plant

The screening plant is very simple.

Washing plant and storage bins from dredge

The material after passing through pipe line is thoroughly disintegrated and in passing over a 40-ft. trough partly bottomed with 3/16-in. wire-cloth screen the gravel is separated from the sand. The gravel is elevated by a bucket conveyor directly into standard railroad open top cars.

The sand, after its separation from the gravel, is pumped by an 8-in. centrifugal pump, also operated by a 60-h.p. crude oil engine, to a height of 30 ft. where it is precipitated into two large bins. The railroad passes directly under these bins where open top cars are loaded by a series of gates.

The plant has a daily capacity of from 12 to 14 cars of 35 cu. yds. each and is operated by a crew of only 5 men.

Disposal of Material

The gravel and sand is hauled over the gravel company's track by its own locomotives 1⅛ miles to the H. E. & W. T. Ry., where it is distributed over the whole of East Texas for concrete work.

The gravel is of a quartz formation ranging from ⅛ to 1¼-in. in diameter.

The sand is a fine, sharp building sand, free from clay and organic matter, it is used most extensively by the U. S. Government engineers on harbor and coast defense works, by concrete contractors, and by the various railroads of Texas for both concrete work and engine sand.

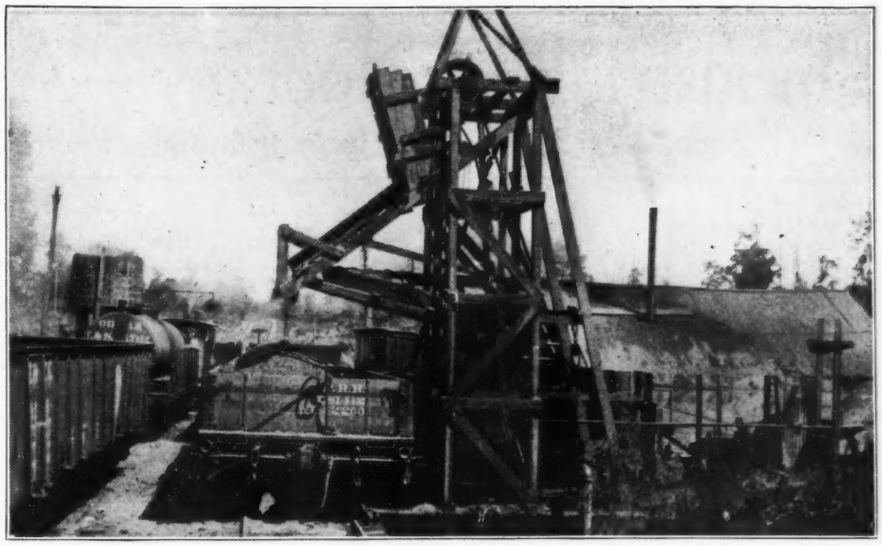
The Urbana Gravel Co. is now making plans for a duplicate plant of a larger capacity to adjoin its present location. D. M. Filler, superintendent of the company, will be in charge of construction of new installation.

Side Line for Gravel Plant

THE ACCOMPANYING view is from a photograph taken in the yard of the E. T. Slider Co., sand and gravel producers, at Louisville, Ky. It shows a mixing plant operated by Jefferson County, which prepares hot tar and gravel for application as cold mixture in patching holes in the county roads. This patching system has resulted in Jefferson County having the best roads in the state, and better roads than it ever had before, as the patching works in tight, and stays put.

The truck in the background is a three-ton type, the county also operating a four-ton truck in the same work. These trucks have dump bodies, and the gravel is hauled to various points along the road where patching is to be started.

This truck last summer averaged 116 miles a day over a period of four months, getting seven miles to the gallon of gas, and only being in the shop for slight adjustments, principally to the hoisting equipment for dumping.



Screening plant—loading cars direct without bins

West Coast Construction Retarded

OAKLAND, Calif.—During the past month there has been considerable delay both in road construction and building operations throughout the State. Unsettled labor conditions have resulted in the canceling of quite a number of large contracts. On account of a strike in the shipyards, the Government has, within the last few days, canceled the contracts for three concrete ships now in course of construction at the Government Island yards of the San Francisco Shipbuilding Co. The amount of money involved in the three contracts totaling $1,200,000.

Another reason for the delay is irregular railroad service and shortage of cars, making it impossible to supply the necessary materials for the work. Nevertheless, in spite of the various delays, the California Highway Commission has directed that surveys be made and specifications be drawn for a considerable amount of highway to be constructed during 1920. One of these is a concrete highway over the Sierra Nevada range from Auburn to Reno, a distance of 105 miles. It is expected that much of the work will cost in excess of $20,000 per mile.

Bituminous gravel a sideline for sand and gravel plant—County highway material mixed at Louisville plant

Industrial Democracy—An Experience

Success of the Leitch Plan in an Indiana Factory Employing 300 Men

CORDIAL, FRIENDLY, CO-OPERATIVE—and mutually profitable—relations can be established between employers and workers.

This article tells how such relations were brought about in one plant six years ago and have continued unruffled ever since, with results that must read like a fairy tale to the average employer who is eternally confronted with the "labor problem."

I confess that I have derived as much joy in obtaining and writing this article as anything I ever wrote—because it gives the key to the solution of what, to my mind, is the most serious question confronting America today.

This is not a theoretical treatise. It is a record of facts, of practical, workaday achievements in an ordinary, everyday industrial plant. The plan is not a mere experiment. It has been in operation for six years through hard times and good times, through war and peace. It has successfully met the exigencies of piece workers as well as regular wage earners.

Effect on Employees' Home Life

Briefly, The Packard Piano Co. of Fort Wayne, Ind., used to have its share of labor troubles, but its president, Albert S. Bond, one day fully six years ago heard a speech delivered by John Leitch, business engineer, on Industrial Democracy. (The principles of Industrial Democracy have been explained in the previous articles.)

Mr. Bond had worked in the Packard Piano factory from the time he was sixteen until he reached twenty-one, when he was put on the road as a salesman. Five years later he was made manager. He got along with the workmen about as well as the average employer; but after a strike which the company "won," he realized that the majority of the men hadn't the right spirit towards their work. On hearing the Leitch speech, it suddenly dawned on him, to quote his own words to me:

"I had allowed myself to get out of tune with the boys. During my years on the road and as manager I had lost the art of looking at things through their eyes, of thinking their thoughts, of speaking their language. I approached things from a different angle.

"Then and there I made up my mind that I must get back into their hearts, gain their confidence, and work hand-in-hand with them.

By B. C. Forbes

"I did some mighty serious thinking. I concluded that if we were ever to have the best kind of a world for us to live in it was up to employers not to leave the ministers to do all the preaching on Sunday, but to get busy and do the right thing by one another every day in the week, and thus preach good will and brotherliness and all that sort of thing through practice, through application of the Golden Rule in the factory and the office and in every relationship with one's employees as well as with others."

It was in this attitude that Mr. Bond approached Industrial Democracy. Its plan for giving every worker a real voice in the running of the plant in so far as it affected working conditons, hours, wages, etc., appealed to Mr. Bond as eminently fair, eminently democratic and as likely to bring unlimited benefits to all concerned, including the stockholders, since 50 per cent of all savings would go to the company after paying the other half to the men. What has happened in the intervening years let Mr. Bond now tell.

"One of the first things that impressed me after we installed Industrial Democracy, in the fall of 1913, was the effect it immediately wrought upon the home life of the men. Several of the wives of our workers stopped me and asked, 'What are you doing at the factory? John is a different fellow around home. He does not spend so many evenings away from home, and he seems to take more interest in our home and our children. What's the explanation?'

"I found that the habits and characters of the workers had been distinctly improved under their new system of working conditions. Fewer evenings were spent in saloons. Late hours were cut out. As the wife of one man remarked, 'Jim would have a fit if he were not to get up in time to be at his work on the dot.' Their homes and their wives and their children began to mean more to the men. The joy they were finding in their work had an effect upon their whole temperament, both inside the works and inside their homes. Their more regular habits naturally contributed to improving their health, and this in turn helped to make them feel happier.

"This experience convinced me that we were on the right track in seeking first of all to build men. I clearly realized that if we could build the right kind of men, the men would build the right kind of pianos and that, all working together, we could build the right kind of a company. This sizing up of the situation has been abundantly fulfilled, for today we can get both quality and quantity production as no concern run under the old, unsatisfactory economic system can possibly match.

All Got Into Game

"Of course, the movement was not welcomed by every man in the place at the start—there are always in any large group of men some who are suspicious and distrustful. I know that this condition existed, but hoped that the actual working out of the plan would, by its admitted success, cure the skeptics.

"At the end of about a year, however, there were still four or five men who had not acquired the new spirit and had not fallen into line with the rest of the loyal enthusiastic workers. So, at one of our regular mass meetings, I got up and said:

" 'There is a matter I want to bring up, although it hurts me to do it. There are four or five fellows who haven't got into the game, who are suspicious of us, who are saying things about the other men and also about the institution. We must do something to correct this, for it means that these disturbers have got their hands into your pockets, because they make it impossible for you to earn as large wage dividends as you would earn if they fell into step and worked in the same spirit and with the same zeal as the rest of us work. The easiest way would be to get rid of them. But they are all good workers, and my suggestion is that we should, by our example and by our influence, try to show these men the error of their ways and bring them into the family fold heart and soul, so that they will be with us and for us to the hilt, just as the rest of us are with and for one another. I don't need to mention names. You men know who they are. They are sitting in front of me right now. Maybe you will not all agree with my suggestion. You may have something better to offer, but I want to say this. I am not going to discharge these men. If they go it is going to be because you men do not want them.' Immediately one of the men arose and said, I move that we give them a two weeks' trial to show whether they want to get into the game or get out. The motion was put, seconded and carried without a dissenting vote.

"The very next morning three of those fellows when they got on the street car on their way to work spoke to men they hadn't spoken to for some months. Every one of them promptly got into the game and stuck. They realized that they were not working for The Packard Piano Company, but with the members of that organization, and that if they were to hold their jobs they had to work in the right spirit with the fellows with whom they were associated.

"In the summer of 1914, before we had really got Industrial Democracy running with perfect smoothness, the war broke out, the piano business was badly hit, and this subjected the plan to a severe test—although, let me add, if the war proved anything it proved the value of music to the multitude; it proved that music was one of the absolute essentials, both in maintaining the morale of armies and in maintaining right conditions in industrial and social life. I could see bad times ahead and was worrying a good deal over what would be the best course to follow when, to my astonishment, at a meeting in September—within two months after the war started—one of the men, a cabinet maker, read a letter stating that it was clear that there would have to be drastic curtailment of production and more or less shutting down of departments. The letter finished up: 'As a suggestion, I think if we take a day or so off now and then would help a great deal. Take a day or two extra on Labor Day instead of waiting and getting it all in one lump, what is liable to follow if we don't. What do you suggest? Now is a chance to co-operate!'

All Became Efficiency Engineers

"As the discussion proceeded, I began to feel almost like an outsider. The workers began to inquire of one another as to how little they could get along with until things changed for the better. Every foreman volunteered to reduce his own wages 25 per cent. Then, instead of laying off a lot of men, the meeting recommended that the factory run three days a week, and I had to argue with them to convince them that we could keep running four days a week.

"As war jobs offered themselves some of the men who could not very well afford to live on four days' pay, left us, but our readjustment to the war-time conditions was brought about and carried out smoothly and satisfactorily. During the first two years of the war about 100 of our 300 men found places elsewhere.

"Business began to revive briskly in the fall of 1916, and we were then up against a new problem. Materials, wages and costs of all kinds had increased, and it was manifest that we would have to raise prices unless some means were discovered of greatly reducing costs. As usual, the whole matter came up for consideration of the entire force. When I explained the situation the men expressed the fear that any raising of prices would curtail orders. Also, as none of us could be sure that the recovery in business would last longer than the fall months which are always the busy ones in our line, the men felt it would not be just to take back either old workers or engage new ones, seeing that they might have to be laid off as soon as the seasonal spurt was over.

"The decision of the meeting was that there were enough workers to cope with all demands then in sight. Also, the view was then expressed that if everyone applied himself diligently to thinking up ways and means of saving labor, and perhaps inventing new methods to perform some of the tasks, costs could be kept down so that prices would not have to be raised.

"The very next week one man evolved certain ingenious methods for turning out the work he was doing and voluntarily recommended that their rate be reduced from 42 cents to 11 cents per piece, and he made more money at the reduced price. In fact, every workman became, as they said, an 'efficiency engineer.' They took up the problem just as keenly as I, as president, could possibly have done, with the net result that we neither had to increase our force nor raise prices at that time.

"From then on the demand for our pianos kept increasing, and we have taken back every man who has applied. We have even sought out men who were dropped during the war emergency and brought them back into our family. Lately we have been trying to expedite the release of some of our men who are still in the army.

"With us, as with some other plants having Industrial Democracy, we work usually through a committee of the whole. When any subject comes up requiring investigation a special committee is elected. Committees always consist of five members, three elected by the men and two by the company. The men always have the balance of power. It may interest other employers to learn that never has a question been placed before such a committee that it did not work out a solution satisfactory both to the men and to the company. We used to hold an Industrial Democracy meeting of the whole force every week but after eighteen months of it we adopted monthly meetings, as there were not enough questions arising to call for more frequent sessions.

"One point the average employer may not realize the importance of is this: The president's or other chief executive's office door should always be open to every employee. There is no 'Private' sign on my door. If an employee has anything he wants to lay before me he knows he can walk straight in at any time and, no matter what I may be doing, the employee has my immediate attention. The consequence is that not only do our men come to me with purely shop problems, but they often drop in to discuss domestic and other intimate, personal matters. By adopting this attitude, and living up to the spirit of Industrial Democracy, always keeping its ideals actively before them, there is no trouble in getting along smoothly with workers. Even the knottiest of problems have a habit of dissolving under proper treatment.

"For example, recently a foreman came to my office and said there were certain piece workers some of whom received $1.60 for one job and some $1.25 for another, and that they didn't think these rates were fair. They suggested that both rates be changed to $1.50. We called in the workers concerned, and after talking it over it was arranged to the satisfaction of all concerned that the $1.60 rate be reduced to $1.45 and the $1.25 rate increased to $1.45. I could name numerous other incidents illustrative of how little and big questions such as arise periodically in all factories are settled with the same promptitude and the same good will all around.

What the Workers Think

"This whole business of running a plant, or of conducting any other business, whether large or small, reduces itself to a few simple, basic principles. It is either right to do right or it is wrong to do right. One is constructive, the other destructive. The average human being recognizes that it is right to do right. Then why not throw yourself into the game whole-heartedly and try to teach your men how to live and serve and be happy? You can have either the Golden Rule in your plant or—hell. Some men say this isn't practical, that it can't be done. I don't believe there is any such thing as 'can't' when a thing is right and ought to be done.

"Of all things practical, this application of the Golden Rule to business is the most practical. It is nothing more than putting yourself in the other fellow's place and doing what you would want him to do to you. It is just putting into everyday practice the plain, homely truths taught at your mother's knee. If your motive is right things will work out all right.

"Industrial Democracy is the embodiment of a correct, humane, righteous principle. It calls for nothing but playing the game with your workers fair and square, always with your cards on the table face up. But, of course, you must believe in it through and through. Even

then it is not easy at the start to convince your workers that the thing is on the level. You have to sell it to your workers and keep them sold on it by living up to it gladly and thoroughly.

"In our plant we used to work ten hours a day. Shortly after we took up Industrial Democracy we reduced this to nine hours. We gave this a thirty-day trial and at the end of this period it was found that, with two exceptions, every employee did more work than was done in ten hours. These two men were the best we had; it simply showed that they were working at capacity every hour of the ten. Under the nine-hour arrangement our workers earned a dividend, on top of the wages, of 5½ per cent, based on increased production. That was in January, 1914. In May we suggested the feasibility of an eight-hour day. There was some objection to this—fully 80 per cent of our men are piece workers. We urged them, however, to give it a trial for sixty days.

"In the first month we cut the biggest wage dividend we had ever had. And, of course, we have stuck to the eight-hour day ever since."

Mr. Bond is not satisfied to stop at the satisfactory stage already reached in establishing cordial relations with his men. Industrial Democracy, to his mind—as indeed to the mind of its author, John Leitch—can be carried a number of steps further as conditons ripen.

"I want to have every man a stockholder and to have the men represented on the board of directors," Mr. Bond told me with great emphasis. "Then men who do the work and help to make a business a success ought to be regarded as the most valuable part of a concern's assets. Efficient, willing, satisfied labor is to be reckoned as the highest form of capital. Of course, money capital is absolutely essential and must be treated fairly, or failure would result ultimately.

"The ideal arrangement, and one which will probably come sooner or later, would be for capital and workers to share fifty-fifty in all profits after wages and a fair return on capital have been taken care of. There can never be a maximum of progress in industry or in our whole social life until the workers who bring about increased production or lower costs participate equitably in the financial benefits.

Better and Broader Life

"After all, employers are beginning to realize that neither they nor their business will be regarded as successful, no matter how much money they may make, unless in the making of it they produce workmen who are a credit to themselves, to their business and to the nation. The mere building up of a fortune by hook or by crook, and with scant regard to the well-being of workers, affords no high order of satisfaction, but the building of men yields worth-while gratification and happiness.

"Industrial Democracy, I can truly say, after six years of experience with it, has made life better and broader and happier both for me, as an employer, and every worker in our establishment."

Socialization of the German Potash Industry

THE NEW POTASH LAW went into effect in Germany on April 24, 1919. It is designed to socialize the potash industry by giving the workers a larger share in its management and profits, and by unifying its activities under Government control. The provisions of the new law, which supersedes the Potash Law of 1910, vest the control of the entire potash industry in a State Potash Board. This board is composed of eight members representing employees of potash mines and factories, eight representatives of owners of such mines and factories, and 14 representatives of various other phases of the industry, including consumers, dealers, and technical experts.

The details of the reorganization and management of the industry are not prescribed in the text of the law, but are to be worked out by a board of experts and presented to the Government for approval. This board, like the State Potash Board, is composed of representatives of various interests, including consumers of potash; and its personnel is elected by the Government, partly from nominations made by employers' and employees' associations.

The plans for the reorganization must meet the approval of the National Committee and also of a special committee of 28 members chosen by the National Assembly; and after such approval the plans are subject to veto by the National Assembly, provided such veto is exercised within 30 days after the plans are laid before the Assembly.

The National Government not only issues the executive regulations which are to be supervised by the State Potash Committee, but also prescribes the manner of fixing prices of potash.

Probable Details of Reorganization

It is expected that the executive regulations, when completed, will provide for four bureaus—an examining bureau, a bureau for appeals, a wage-examination bureau, and a technical agricultural bureau.

The examining bureau will probably have supervision of matters of current business, including the fixing of the percentages of participation by the various mines in current sales and decisions relative to the interests of employees.

The bureau for appeals will be composed entirely of disinterested persons, who will settle disputes arising between mine owners concerning the allotment of shares of participation in potash sales. Employees will be strongly represented on the wage-examination bureau, whose function will be to settle disputes about wages. The work of the technical agricultural bureau will consist largely of domestic propaganda and advertising with a view to promoting and increasing the use of potash in Germany. This bureau will operate only in the domestic field, leaving the Potash Syndicate free, as heretofore, to choose its own methods for foreign advertising.

Little Cement to Philippines

WASHINGTON, D. C.—Although the Philippine Islands, during the fiscal year 1918, imported more cement than ever before, the imports from the United States fell to a very insignificant total.

Total imports of cement during the year, according to a report just received by the Washington Bureau of ROCK PRODUCTS from the bureau of insular affairs of the War Department, were 228,769 barrels, valued at $580,708, as compared with 182,205 barrels, worth $436,453, during the fiscal year 1918. Imports from the United States, however, which in 1918 were 2,654 barrels, worth $7,669, in 1919 totaled but 101 barrels, with a value of $1,236.

Labor Problems

ORIGINALLY it was owner and slave; then it was master and man; now it is employer and employe, each stage of development bringing the employer and employe into closer co-operation.

In the past, the man who was not educated or trained to think independently struck because he wanted $2 a day if he was only getting $1.75; and for a period labor differences were settled on this basis.

I believe that we are rapidly passing out of that period, for our laboring people are so well educated and so able to think independently that, in many cases, they are no longer striking for a definite increase in wages, but for what they regard as a fairer proportion of the profits of the business.

If I am right about this, then we are rapidly leaving behind the period when labor disputes could be settled by a mere increase in wages and are entering the period when profit-sharing in some form must be practiced.—Geo. W. Perkins.

Home-Made Gas Producers Increase Lime Burned Per Unit of Fuel 50 Per Cent

Glencoe Lime and Cement Co. Replaces Coal-Fired Furnaces with Semi-Gas Producers—Gets Better Lime at Much Less Cost for Fuel

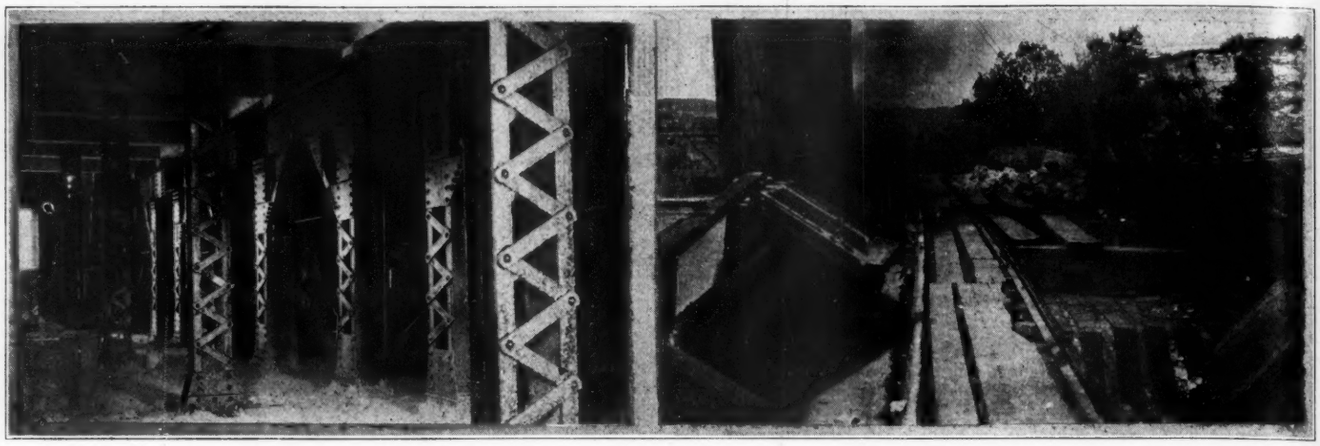
TO GET A BETTER fuel ratio than 3½ to 4 lbs. of lime to 1 lb. of coal in an old kiln installation, the Glencoe Lime & Cement Co., St. Louis, Mo., did a lot of experimental work. Through the courtesy of Col. C. W. S. Cobb, president of the company, ROCK PRODUCTS is able to present herewith the detail drawings of the semi-gas producer type of furnace which has been evolved as a result of these experiments This method of firing has made it possible to increase the amount of lime burned per pound of coal to between five and six pounds, or nearly 50 per cent.

With the accompanying illustrations very little explanation is needed except to say that the transition from the old coal-fired furnace to the semi-gas-producer type is accomplished at a small relative expense (about $500 per kiln) by ordinary brick masons' labor. It should be emphasized, however, that the size of, and placing of, the gas producer with reference to the height and other dimensions of the kiln are matters which Colonel Cobb believes must be determined by local factors and experiment.

The limestone burned at this plant of the Glencoe company (Glencoe, Mo.), is a high calcium stone. The kilns are covered at

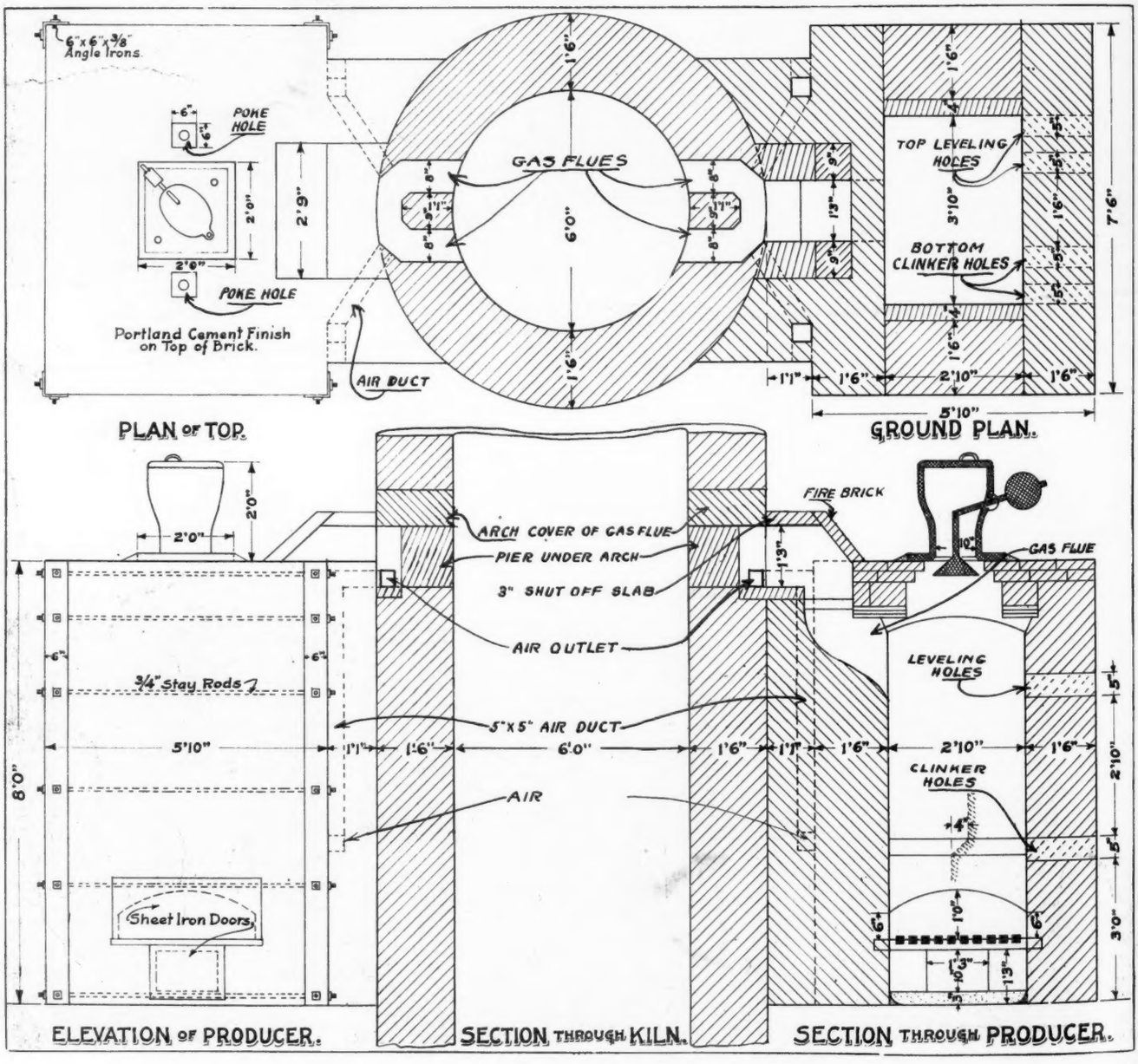
Glencoe quarry of the Glencoe Lime and Cement Co.

Glencoe plant (No. 4) of the Glencoe Lime and Cement Co.; note difference in smoke from stacks—the farthest one is over old coal-fired kiln

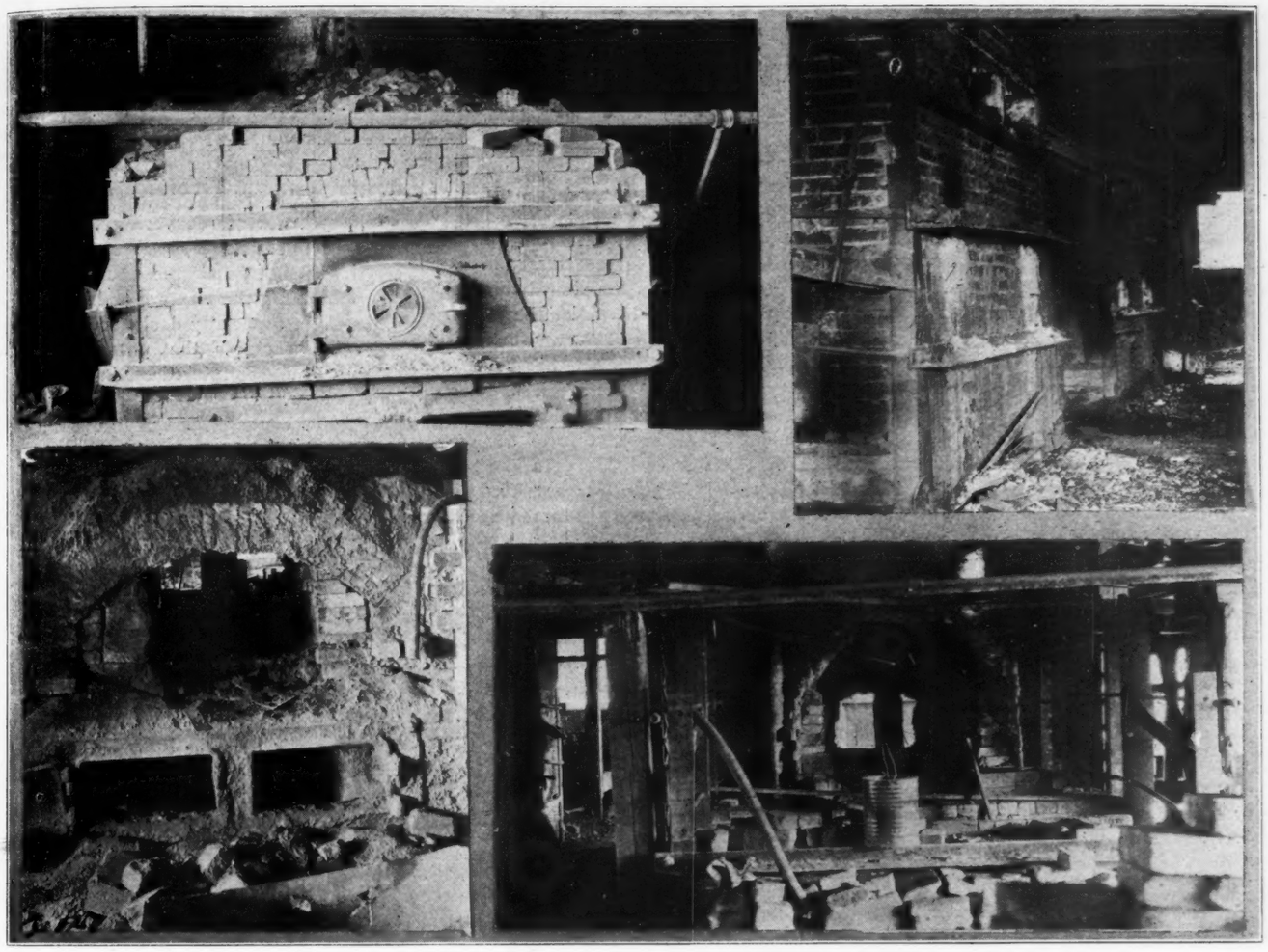


Drawing floor of kilns

Kiln charging track

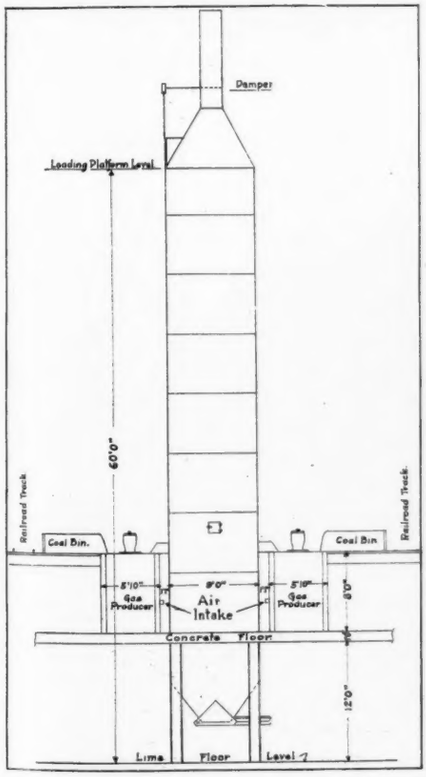


Details of semi-gas-producer type of furnace developed by Glencoe company

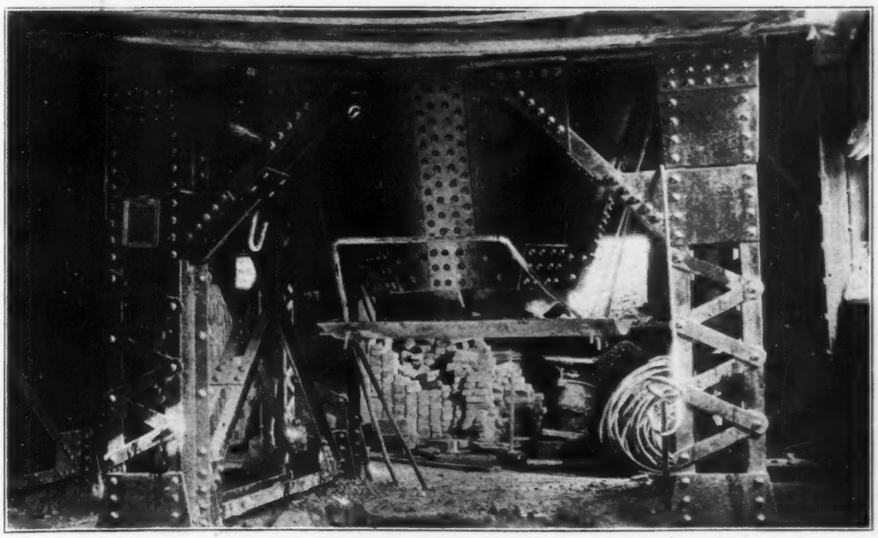


REBUILDING FURNACES OF OLD LIME KILNS

Three views showing old-style coal-fired furnace and various stages in its reconstruction into the semi-gas-producer type, as shown completed in upper right-hand view



Kiln and gas producers



Drawing cone and mechanism—not changed

the tops with steel cones and are provided with dampered smoke stacks. The stone is fed into the kilns through trap doors on one side of the kilns, as shown in one of the accompanying views. As operated at present the furnaces do not require the use of steam or water to temper the flame or produce draft.

The essentials of this type of semi-gas-producer furnace were described in ROCK PRODUCTS of June 19, 1918, pp. 18-20, and August 28, 1919, pp. 21-22, by E. Schmatolla, whose designs and suggestions formed the basis of the Glencoe improvements. Changes and adaptations of Mr. Schmatolla's design were made by the late Philip J. Dauernheim, general superintendent of the Glencoe company's plants.

In the ordinary coal-fired furnace, like those being discarded by the Glencoe company, there is a big loss of fuel values contained in the volatile matter or combustible gas which is suddenly developed in great excess to the air available for complete combustion, when green coal is thrown over the hot layer of coke or half-consumed coal of a previous charge.

The type of semi-gas-producer furnace illustrated is therefore merely a device for controlling or regulating the combustion of the coal in the furnace to prevent these combustible gases from escaping into the atmosphere without having done their share to convert limestone into lime.

New Head of Chemical Bureau of Lime Association

TO SUCCEED Allen D. Whipple, whose resignation as chief of the chemical bureau of the National Lime Association, was noted in the October 25 issue of ROCK PRODUCTS, the board of directors of the Association has appointed Sidney P. Armsby, acting chief.

Mr. Armsby has been serving as special agricultural representative in District No. 4. He has had considerable laboratory experience covering a wide field of industry, including the manufacture of explosives, calcium carbide and other electro-metallurgical products; and the inspection of commercial fertilizers. He has had both analytical and executive experience in various phases of the iron and steel industry, and also as chemical engineer in charge of installation of water-softening outfits employing lime.

Along engineering lines, he has held responsible positions connected with the construction of sand-asphalt and concrete roads, and the installation of sewer and water-supply systems. Also, as an officer in the Chemical Warfare Service, he had charge of construction and maintenance of all chemical plants for the Small Scale Manufacturing Section, and shortly before joining the staff of the Lime Association he was engaged in concrete ship construction in Florida.

World's Greatest Lime Plant

Ten 8x125-ft. Rotary Kilns in Plant Under Construction at New Brunswick, N. J., for Eastern Potash Corporation

THE LIME PLANT of the Muscle's Shoals air nitrate works, described in ROCK PRODUCTS of July 5 and July 19, 1919, is soon to be far outclassed in both size and capacity by the plant being built at New Brunswick, N. J., for the Eastern Potash Corporation of New York City. The Muscle's Shoals plant has seven 8x125-ft. rotary kilns, of which five were designed to be operated at one time, giving a daily lime production of 500 tons. The Eastern Potash Corporation plant will have ten 8x125-ft. rotary kilns and will produce 1,000 tons of lime per day.

Result of War Activity

The Eastern Potash Corporation was developed by the world war and the shortage of potash for American agricultural needs. Approximately $150,000 was expended in research work to find suitable raw materials and to develop an economical process of extraction and by-product utilization.

The raw materials to be used in this case are the greensand or glauconite deposits of the Atlantic States, which contain from 7 to 8 per cent of potash and limestone from the New Jersey deposits at McAfee. The greensand lies near the surface in many New Jersey deposits and can be readily excavated by steam shovel.

The quarry property acquired by the corporation is that adjoining the Bethlehem Mines Corporation property at McAfee. Here a crushing plant of about 2,500 tons daily capacity is under construction at the present time. The crushed limestone will be transported to New Brunswick by rail and converted into lime.

Simple Chemical Process

The process of recovering the potash from the greensand consists of mixing equal parts of quicklime and greensand and subjecting the mixture to high steam pressure in especially designed digesters. The lime replaces the potash in the greensand and is filtered off in the liquor obtained in the digesters. This liquor is of course concentrated and evaporated yielding the potash salts.

Sand-Lime Brick a By-Product

The residue after drawing off the potash-bearing liquor is a lime silicate similar in nature to the mixture made for sand-lime brick. This residue by means of special machinery can be readily converted into building brick, tile, roofing tile, etc.

Lime for Agriculture

Another outlet for the lime residue the corporation expects to develop is in the agricultural field. The quarry operation is also expected to produce a considerable amount of fines which will be pulverized for agricultural purposes.

Officers

The plant now building at New Brunswick, N. J., will occupy 61 acres, and have a capacity of from 20,000 to 30,000 tons of pure potash per annum, or 150,000 tons of commercial potash salts. The estimated cost of the plant is $2,500,000.

The president of the company is Waldemar Schmidtmann. Thomas C. Meadows is general manager. The engineering staff includes O. H. Landreth, professor of civil engineering, Union College, Schenectady, N. Y.; E. B. Miller, operating manager, Davison Chemical Co., Baltimore, Md.; R. K. Meade, of R. K. Meade & Co., Baltimore, Md., and W. E. Wadman, chemical engineer of Bayonne, N. J. Mr. Meade is the engineer in charge of the design and construction of the lime plant. The superintendent of quarry and crushing plant is S. B. Martin, formerly of Martin's International Trap Rock Co., Bruce Mines, Ont.

It is the intention of the company, if the present venture proves as profitable as expected, to erect a chain of similar plants extending the length of the greensand belt. It is claimed that the sale of the principal by-product—the sand-lime brick—alone will yield a profit, and that importations of European potash cannot be made at prices low enough to compete with the greensand product.

Profit Sharing

NO PARTNERSHIP where the profits are shared by two or a half dozen partners could last any length of time unless mutually beneficial, and the same rule holds good in a larger partnership where the profits are shared among many partners.

No man or firm or corporation that is thinking of adopting profit sharing can hope for success, unless prepared to approach the subject in this spirit and deal with it in an absolutely honest, open and broad-minded manner.—Geo. W. Perkins.

Effect of Fineness of Portland Cement on Strength of Concrete

Results of Investigations Covering Four Years and Including About 20,000 Tests

(Abstract of paper before the American Society for Testing Materials, Atlantic City, 1919)

By Duff A. Abrams
Lewis Institute, Chicago, Ill.

THE RECENT REVISION of the standard specifications for portland cement has focused considerable attention upon the effect of fine grinding of cement. In spite of all the experimenting done in this direction, there has been, due to the restricted scope of investigation, but little conclusive information with reference to the effect of fineness of cement on the strength of concrete as it is now being used.

An investigation of the fineness of cement has been under way at Lewis Institute for the past four years. Five independent series of tests have been completed and another is in progress.

Sand and gravel aggregate for this investigation was obtained from the Chicago Gravel Co.'s Elgin, Ill., plant; crushed blast-furnace slag from the Illinois Improvement and Ballast Co., and burned shale from the U. S. Shipping Board, Philadelphia.

The cement used represented the product of seven commercial mills and was representative of cement-producing districts east of the Mississippi River. Samples were ground at the plant to 4 to 7 degrees of fineness, which gave residues ranging from 2 to 43 per cent on the standard 200-mesh sieve. Fifty-one different samples of cement were used. In all tests, 94 lbs. of cement was considered 1 cu. ft.

Scope of Investigation

This report covers the following tests:

Concrete

Compression tests on 2x4 in. cyl.....6125

Cement and Mortar

Compression tests on 2x4 in. cyl.....4935
Tension tests of briquets.....4065
Miscellaneous tests of cement..... 600
Miscellaneous tests of aggregates..... 200
Chemical analysis of cement..... 100
"Slump" tests for consistency of concrete 2300
Modulus of elasticity of concrete.....3200

Definite information has been secured on the effect of fineness of cement on the strength of concrete under the following conditions:

a. Using different cements (51 samples from 7 different mills).

b. Effect of quantity of cement used (mixes from 1-10 to neat).

c. Effect of consistency of concrete (relative consistency 0.90 to 2.00).

d. Effect of size and grading of the aggregate 0.28 sand to 0-1½ in. aggregate).

e. Variation in the type of aggregate (sand and pebble, blast furnace slag, and burned shale).

f. Variation in the age of concrete (7 days to 1 year).

g. Elongation and contraction of concrete (different mixes and consistencies for water and air storage).

The effect of fineness of cement on the plasticity or workability of concrete was an important feature of the tests.

In order to facilitate reference, these tests were run in series 20, 31, 60, 118 and 120. Each cement is designated by a letter and a number—the number indicating the coarseness.

Summary of Conclusions

1. *No necessary relation between fineness of cement and strength of concrete if different cements are considered.*
2. *Cements with residues on 200-mesh sieve lower than 10 per cent are erratic;* (3) *above 10 per cent, strength varies with the amount of residue.*
4. *Fine grinding more effective with lean than rich mixtures;* (5) *shows greater effect at 7 days than 1 month or 1 year;* (6) *independent of consistency of concrete for normal mixtures;* (7) *2 per cent increase in strength for 1 per cent reduction in residue;* (8) *hastens early hardening, but fails to prove larger particles do not hydrate;* (9) *no appreciable effect on workability of concrete;* (10) *time of setting shortened;* (11) *requires more water.*
12. *Unit weight of cement decreases with fineness.*
13. *Proportioned by weight, fine grinding gives a greater volume of cement.*
14. *Fineness has no appreciable effect on density of concrete.*
15. *Concrete expands in damp sand and water; contracts in air.*
16. *Fineness has no effect on expansion and contraction of concrete.*
17. *No relation between effect of fineness of cement and type of aggregate.*
18. *Intimate relation between strength of concrete and water ratio.*
19. *Increase in cement by 1 per cent increases strength of concrete like amount;* (20) *increase more effective in lean than rich mixtures;* (21) *more effective at early than later periods;* (22) *independent of consistency of concrete.*
23. *Compression tests best for studying different cements.*

Tests as Run

Series 20 was begun in August, 1915, and was carried out in co-operation with subcommittee on strength of Committee C-1 on cement of the American Society for Testing Materials. Five different cements were used, each ground to form different degrees of fineness, varying from 10 to 33 per cent residue on a 200-mesh sieve. Two concrete mixers and three mortar mixers were used.

Series 31 followed in March, 1916. Two cements were ground to 7 different degrees of fineness, and one of five degrees, varying from 2 to 34 per cent residue on a 200-mesh sieve. Greater emphasis was placed on concrete. Five concrete and two mortar mixers were used.

Series 60 (October, 1916) was for the purpose of determining the effect of fineness of cement on the strength of mortar made of sands of different grading. Series 118 (November, 1918) was for the purpose of determining the effect of fineness of cement on rich concrete of different consistencies. Series 120 (begun December, 1918) was for the purpose of determining the effect of fineness of cement for a wide range of mixtures, consistencies, size and grading of concrete and age of concrete. In two groups of tests, measurements of elongation and contraction were made on 6x12-in. cylinders stored in damp sand, air and water. One year tests of series 120 are not due.

Definition of Terms

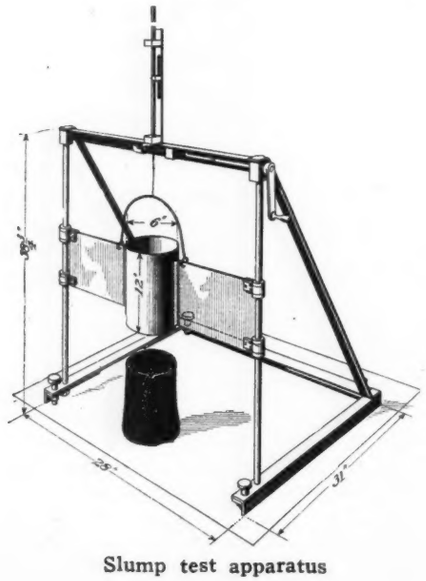
The "fineness modulus" of the aggregate may be used as a measure of its size and grading. It is the sum of the percentages in the sieve analysis divided by 100. Sieve analysis is expressed in terms of the weight or volume coarser than each sieve. Tyler standard screen scales are used.

Most test pieces were 6x12-in. cylinders. Concrete for each specimen was proportioned separately, mixed by hand in a shallow metal pan, and put into the cold-drawn, split-tube form in 4-in. layers, each layer being puddled with 25 strokes from a 5/8-in. round steel bar pointed on the end. A neat cement cap was put on the cylinder 2 or 3 hours after it was cast. Twenty-four hours after molding, the form was removed, specimen weighed, marked and stored in damp sand.

The mixtures in series 20 and 31 are expressed in volume of cement, fine aggregate and coarse aggregate, such as a 1-2-4 mix. The actual quantities of aggregate in a mix were determined by weight. Series 60 was proportioned by volume, using the same quantity of cement as a 1-3 standard sand mortar. In series 118 and 120 the mixtures as one volume of cement to so many volumes of aggregate. The exact equivalent of the latter will vary for different size and grading of aggregate. The 2x4-in. cylinders were made in a similar manner, except that the mortar specimens were stored in water and tested damp. Briquet specimens were made as described in standard cement specifications, stored in water and tested damp.

The water content of the concrete is expressed in terms of "relative consistency" or "water-ratio." A relative consistency of 1.00 (normal consistency) is of such plasticity that the concrete of usual mix will "slump" ½ to 1 in. if the form is withdrawn by a steady upward pull immediately after the cylinder has been molded. Slump is measured from the original height to the top of the cylinder after the form is removed. The slump test apparatus is illustrated below. A relative consistency 1.10 indicates that the concrete contains 10 per cent more water than required for normal consistency.

The water-ratio is the ratio of volume of water to volume of cement in the batch.



Slump test apparatus

A rich mixture will give a low water ratio and a lean mixture a high water ratio.

Relative consistency refers to the plastic condition of the concrete without reference of the actual quantity of water as compared to the cement, while the water ratio is concerned only with the actual quantity of water as compared to the cement, and takes no account of the plasticity of the concrete.

Special Apparatus

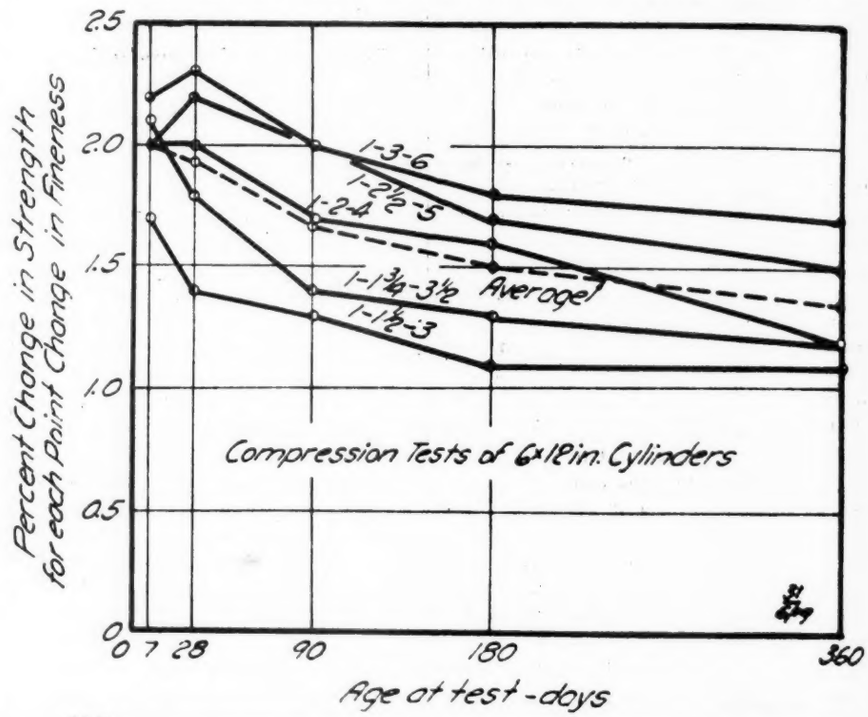
A special apparatus was used in determining elongation and contraction. It consisted of a framework to hold the cylinder at an incline position in V-shaped seats and a means for accurate measurement of change of length.

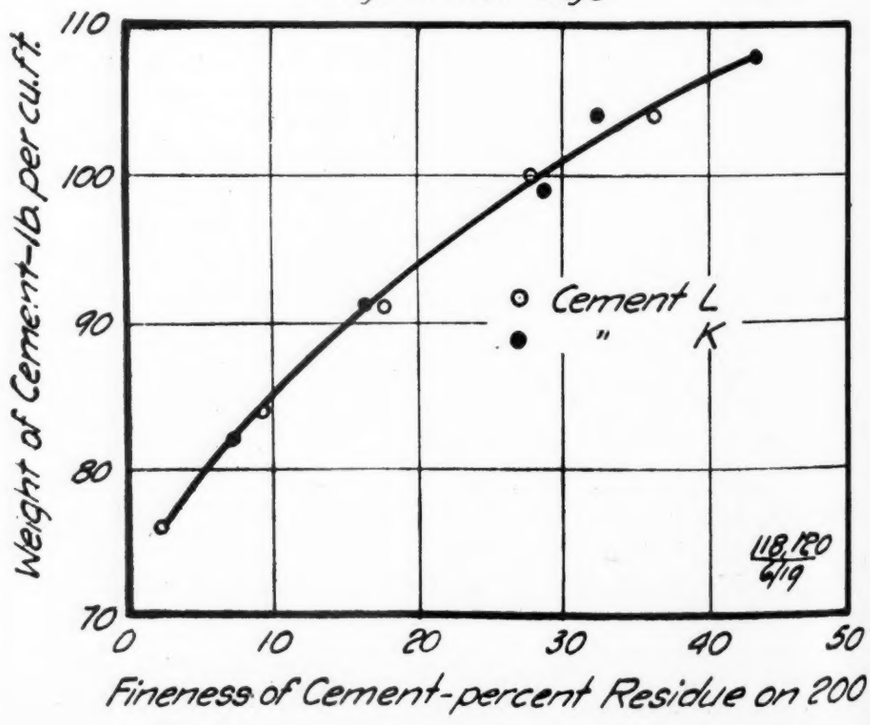
The lower end of the cylinder rests against a 2-in. circular plate, while the length is measured to 0.001 in. by an Ames dial, which makes contact with the other end of the cylinder by a second 2-in. plate with a spherical seat.

Effect of Fineness on Strength

In considering the results of tests made on the effect of fineness of cement, most weight was placed on the results of the compression tests of the 6x12-in. cylinders.

Results show that in general there is an





increase in strength of concrete with the increase in fineness. There are, however, notable exceptions to this rule, where the residue is less than 10 per cent on a 200-mesh. The increase of strength of concrete plots against the fineness of cement as a straight line. The increase of strength of concrete for 1 per cent decrease in residue is much more in the case of a lean mixture than a rich mix. It is also evident that the fineness of the cement increases the concrete strength at seven days much more than when the concrete is older.

It is noted that for all conditions of consistency, mix, and grading of aggregate, the strength falls off for the finest cement. The tests also show that extremely fine cements are likely to be erratic in their behavior.

Upon comparison of the effect of fineness of various cements, the variation shows that there is no necessary relation between fineness and increase of strength.

The strength of concrete falls off rapidly as the quantity of water increases above a normal consistency or decreases below a relative consistency of 1.00.

The water-ratio is the ratio of the volume of water to the volume of cement in the batch. Investigations indicate that this ratio may be used as a measure of the strength of concrete for given materials and test conditions, regardless of mix, size of grading of the aggregate, or relative consistency of the concrete so long as the concrete is plastic and the aggregate is not graded too coarse for the amount of cement used.

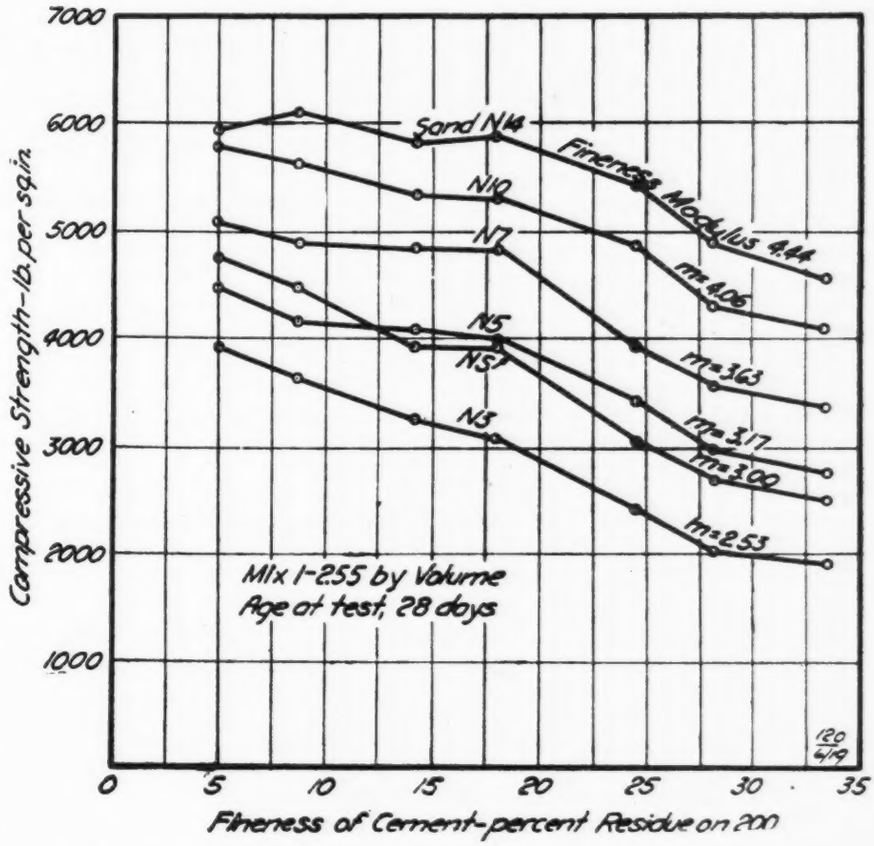
Consistency of the concrete has but little influence on the rate of change of strength due to fineness of grinding of cement, except in the case of a very wet mixture.

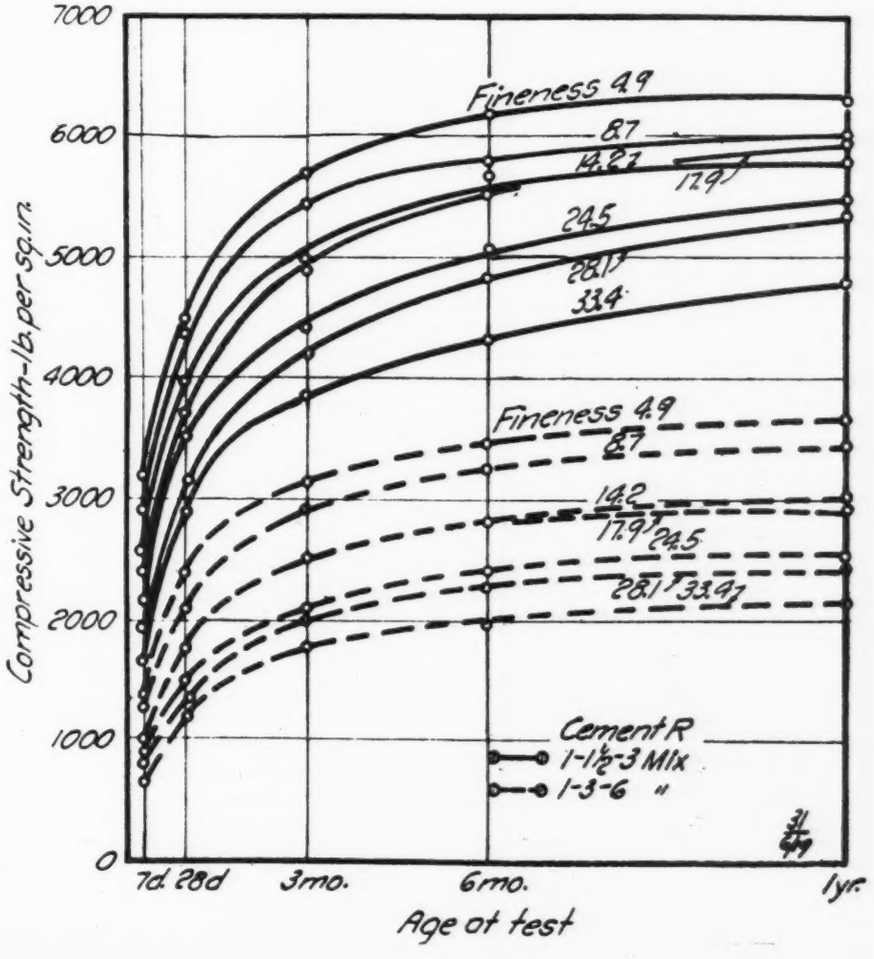
The effect of fineness was studied in a wide range of mixes. For a given plastic condition, the strength of concrete increases with the quantity of cement for all finenesses and consistencies. The rate of increase is higher for the lean mixes than the rich, and is practically independent of the consistency of the concrete. It is higher at early stages than at later stages. The fineness of cement has little or no effect upon the rate of increase of strength, due to a given increase of cement.

The finer aggregate shows a somewhat greater increase in strength due to fineness of cement than the coarser gradings.

Strength Not Dependent on "Flour"

It seems that the rate of change of strength of concrete decreases rapidly with the age of the concrete. A study of data shows that for the usual mixtures tested at 28 days, the increase of strength was about 2 per cent for each 1 per cent reduction in residue on a 200-mesh sieve. At 7 days, 3 months, and 1 year the corresponding values are about 2.5, 1.7 and 1.4 per cent. These tests do not bear out the common





belief that the strength of concrete depends only upon the "flour" content, but indicates that fine grinding merely hastens the action of the cement.

The mortar tests confirm the results of the concrete tests. The briquet tests, however, were somewhat erratic and can not be interpreted as showing the same relations as found in the case of concrete investigations. Increase in the strength of mortar with the increase of fineness of cement is in general shown.

Specimens were stored first in damp sand and then followed by periods in air and water to determine elongation and contraction. Concrete of all consistencies and mixes showed expansion in damp sand and water storage and contraction in air. The change of length is practically independent of fineness and is influenced only slightly by mix; rich mixes show less tendency to vary in length than lean.

Results

The yield is computed on the basis of the original volume of the mixed aggregates. The yield is practically unaffected by the fineness, but is clearly effected by consistency and mix of concrete. For a 1-5 mix of aggregates graded to 1½ in. there is a yield of 1.05. The yield is increased for rich mixtures and aggregates of small size.

Density is computed upon the total volume of solids in the mass. For ordinary mixtures, such as 1-5, and for usual consistencies, the density is usually 0.82.

The slump is greatly increased with the consistency of the concrete, but fineness has but little influence upon it. Lean mixtures and wetter consistencies are effected more by fineness than mixtures of usual consistency.

The finer the concrete, the less the weight. Cements used varied in weight from 76 (residue of 2.4 per cent) to 108 lbs per cu. ft. (residue 43.3 per cent). By reducing the residue on a 200-mesh sieve 1 per cent the weight of the cement is reduced ¾ lbs. per cu. ft. Early specifications were based on the theory that the heavier the cement the stronger, and yet at the same time it was insisted that the cement should be fine.

The Vicat needle tests for initial sets were somewhat erratic; however, the finer cement showed a much shorter time for initial setting. In some instances the time of setting was so reduced as to probably make the cement unfit for building purposes.

The normal consistency (by weight) is increased with fineness. It is increased about 0.1 (in terms of weight of cement used) for each 1 per cent reduction of the residue on the 200-mesh sieve. Normal consistency by volume is slightly increased with the fineness.

Although three different types of aggregates were used, there is no reason for stating that the behavior of cement with reference to fine grinding is any different for different aggregates.

Order Road Materials Early

United Action Urged to Overcome the Deficiency in Open-Top Cars —Storage of Material Cheaper Than Delays in Summer

WASHINGTON, D. C.—While the expenditures during 1919 for hard-surface highways, according to estimates of the Bureau of Public Roads of the United States Department of Agriculture, will set a new record with a total of $138,000,000, this figure is small in comparison with the computed available total for 1920 of $633,000,000, the spending of which promises to be dependent chiefly on the quantity of materials the present limited railway facilities can transport.

The items entering into next year's estimate are: Brought forward from unfinished work, 1919 contracts, $165,000,000; funds available from State and county taxes and Federal aid, $273,000,000; one-fifth State and county bond issues not before available, $50,000,000; one-third unexpended balance of State and county bond issues previously available, $45,000,000; available from new bond issues to be voted on in the fall of 1919 and spring of 1920, $100,000,000.

Unless the available open-top cars, many of which normally lie idle in the late winter, are utilized in that slack season, the work which can be done will necessarily be curtailed for lack of materials. The total for 1920 is more than four times the amount that has been expended during any previous year for like purposes. Therefore there must be a tremendous increase not only in the material supplies and shipping facilities, but also in the labor supply, and an enlargement of contractors' organizations. First of all, according to Thomas H. MacDonald, chief of the Bureau of Public Roads, the attention of all State, county and city road-building interests should be directed toward overcoming this car shortage. To this end it is recommended that the shipping of materials begin earlier than usual. The first step in accomplishing this, Mr. MacDonald points out, is to place under contract during December and January as great a mileage of roads as possible.

It has been customary to wait until contractors' organizations were ready to begin work before starting the shipment of material. Under these conditions many thousands of open-top cars lie idle during the latter part of February, all of March and the earlier part of April. During the past spring the number of open-top cars that were idle totaled more than 250,000. This, of course, was partly unavoidable owing to the late date at which work got under way, following the signing of the armistice. By awarding contracts as early as possible, contractors will be able to ascertain their material requirements at different points, and so will be in position to place orders dependent on rail transportation a considerable time in advance.

While the placing of material in storage, which may result from such a course, involves some expense, it will be small compared to the loss that will result if contractors are not in a position to go ahead with the work because of lack of materials. In view of the experience of 1919 and the greatly increased program for next year, it seems probable, according to the Bureau of Public Roads, that contracts which are not awarded during the winter months will have little opportunity for being supplied with materials which require rail transportation.

The Coal Miners' Strike

IT IS IMPOSSIBLE for anyone to predict at this time what effect the miners' strike will have upon business activities. So far as sand and gravel producers are concerned, it is not a question as to whether there are cars available for their loading, but rather, whether there is sufficient fuel on hand to permit railroads to haul material after it is loaded and at the same time provide enough coal to supply homes and public institutions with heat, light, water and other necessities of life—E. Guy Sutton, Business Manager, National Association of Sand and Gravel Producers.

Ought to Get Cars

E. GUY SUTTON, business manager of the National Association of Sand and Gravel Producers, reports a telegram received Nov. 5 from the Railroad Administration:

"There should be no limitations placed upon sand and gravel loading by reason of the fuel conservation program. Present effort is to provide greatest possible number of cars for movement of road material."

Mr. Sutton reports further that:

"If you are denied either cars or fuel, we suggest that you take up the matter first with your local, division or regional railroad officials, making reference to the foregoing communications.

What Our Readers are Thinking

Some Corrections in Regard to Jasper Stone

Sir—In your issue of September 27th you have a well-written article on the quartzite quarry at Jasper, Minn., except that you advertise an error in the crushing strength of other stones, and the matter is important to us because it is being supplied on specifications which call for stone of a higher resistance than you credit it.

You say that Dell Rapids stone has a crushing strength of only 10,000 lbs., while the United States Geological Survey gives a series of tests which show that it runs from 20,000 to 32,000 lbs. You say Sioux Falls has 14,000 lbs., while the Survey gives a series of tests which show that it runs from 21,000 to 30,000 lbs. You say German "silex" has a crushing strength of 40,000 lbs. and is the only one comparable with the Jasper stone. How about the Berlin, Wis., stone, which the Survey shows has a crushing strength of over 60,000 lbs., and describes it as the hardest rock commercially quarried?

The writer (who happened to be at Jasper about two weeks ago) knows that the cutting machines you describe are not in use and have apparently been "junked" for months, and whatever blocks are there, are being cut as paving blocks are the world over—with buster, reel and tiffler. The Jasper stone is no different from all the other stone within an area of 50 miles square, of which Sioux Falls is the center—no better—no worse—and a general test of stone from the four points of the quartzite belt (Dell Rapids, Salem, Rowena and Luverne) will show that it runs uniformly 93 to 96 per cent silica.

You say good hard limestone has a crushing strength of only 8,000 to 12,000 lbs. per square inch. There are a dozen limestones in the State of Wisconsin alone which range from 30,000 to 41,000 lbs. crushing strength per square inch—the latter at Marblehead.

WISCONSIN GRANITE CO.
Per J. J. Sloan.

Chicago, Ill., Sept. 30, 1919.

Time for Action

SIR—During the war we accepted the car shortage philosophically, realizing that such was inevitable owing to our lack of preparation for the situation that confronted the nation. We had hoped after the war was over that conditions would revert to normal, or at least everybody would get to work and try to make up for the time that had been lost by the war.

This seems not to be the case. In fact we are apparently in worse condition now than we were during the height of the war: "Confusion seems worse confounded." Instead of everybody getting back to work and doing their very best to make up for lost time, we have trouble makers going over the country attempting to disorganize industry and a few dictating, or trying to dictate, to the other hundred million.

Two prominent crushed stone producers of the Sunny South—Thomas McCroskey of the American Limestone Co., Knoxville, Tenn. (on the left), and B. T. Sparks, secretary and general manager of the W. J. Sparks Co., Mt. Vernon, Ky.—Snapped by the Editor.

I have been practically in every Southeastern state in the last few months and have not met a single man who is not dissatisfied with the conditions; and all seem to be anxious to get back to work, but are hindered by the numerous agitators over the country making trouble.

It seems to me this agitation has gone far enough and that the Administration should assume a firm attitude toward all these labor troubles and insist that a man who does not want to work should get out of the way and give some one a chance who does. Not to work is any man's privilege if he can live without it, but he must remember that there are some people who cannot live without work, and most of them are willing and anxious to work if given the opportunity.

My own opinion is that the Administration is losing a very valuable opportunity by not taking a definite stand, declaring publicly they will no longer tolerate what has been occurring.

Every good roads proposition, all street improvements, bridges, homes and building will be stopped and all quarries and gravel pits shut down unless the recent order of the Railroad Administration prohibiting the use of open-top cars for other than coal shipments is rescinded. While I realize they possibly had no other alternative at the present moment, it should be the business of the Government to see that such a necessity does not occur again. This is my understanding of the Government and I am not alone in looking to the administration to see that the Government is maintained.

As Grover Cleveland once said: "It is a condition and not a theory that confronts us."

If this matter is taken in time it can be checked and the country brought back to normal conditions, but if the present attitude of do nothing is persisted in, it is bound to grow worse from day to day and can only result in the inevitable.

THOS. McCROSKEY.

Knoxville, Tenn., Oct. 25, 1919.

WHAT Mr. McCroskey has written above is of more than ordinary interest because he is the general manager of probably the only organization in the rock products industry which has thus far introduced industrial democracy into its management.

The editor is very glad to publish these views and hopes that other readers will contribute their thoughts on subjects related to the industries; so we can have at least a page in every issue on what our readers are thinking about. Will you help?

—THE EDITOR.

War-Time Coal Rules Soon in Effect

Dr. Garfield, Old-Time Friend of the Rock Products Industries, Again in the Saddle with Same Old Preference List

WITH THE RAILROAD ADMINISTRATION as the chief agency in the handling of commercial coal during the mine strike, Walker D. Hines, director general, made public the procedure to be followed in distributing the fuel diverted under authority conferred by Dr. H. A. Garfield, fuel administrator, according to the Washington correspondent of the Chicago "Tribune."

A regional coal committee is to be set up in each of the regional railroad districts, with centers in Chicago, St. Louis, Cleveland, Pittsburgh, Atlanta, Roanoke, Philadelphia, Boston, and New York.

Dr. Garfield will have a representative on each, and the regional directors will appoint the other members. These eight bodies will act in conjunction with a central coal committee in Washington.

Commercial consumers must make applications for coal to the regional boards through the railroad which is to make the delivery of the fuel. The bituminous coal diverted will be distributed only to consumers with no reserve supplies, in the order of priority set out in the preference list which Dr. Garfield restored recently.

System of Distribution

The system of distribution will be as follows:

"1. Bituminous coal, including lignite, taken and held in accordance with the instructions of the director general of Oct. 29 and 31, 1919, or thereafter, will be handled by the director general and the regional directors through the agency of a central coal committee at Washington and regional coal committee which will be established jointly by the regional directors and the fuel administration. Such regional coal committee will comprise the following representatives: One appointed by the United States Fuel Administration and such others as the regional director may select to handle in matters of purchase, distribution and accounting.

For Emergency Accounting

"2. The bituminous coal held must be distributed only to those consumers who have no reserve supply and must have coal to meet their emergency needs. The following order of preference shall govern the regional coal committee in such distribution as they may make within their jurisdiction for emergency consumption in the United States and Canada:

(a) Railroads, (b) army and navy, together with other departments of the Federal Government, (c) state and county departments and institutions, (d) public utilities, (e) retail dealers, (f) manufacturing plants on war industries board's preference list, (g) manufacturing plants not on war industries board's preference list, (h) jobbers, (i) lake, (j) tidewater.

Direction for Shippers

"3. When commercial coal is diverted to other than original consignee promptly notify shipper and original consignee of each car and keep adequate record for later settlement.

"4. Originating coal roads should hold a considerable portion of the commercial coal near coal way-billing points, available for prompt distribution.

"5. Intermediate and terminal carriers should, as far as practicable, move commercial coal to and hold it in the vicinity of points most convenient for prompt rehandling and distribution.

"6. Coal must not be delivered to commercial consumers either in accordance with the priority list (established in rule 2) or otherwise except with specific authority from the coal committee having jurisdiction.

"7. Regional directors will immediately notify each railroad under federal control of the regional committee with which it shall deal.

Reports by Railroads

"8. Each railroad shall report at once to the central coal committee and to the regional coal committee the name, title, location and telephone address of the representative in whom this whole matter will be centered for that railroad.

"9. In order that the central coal committee may be informed of the requirements for coal in each region and of the necessity for transferring coal from one region to another, each regional coal committee will make such daily reports to the central coal committee as are provided for herein and may be called for from time to time.

"10. Each railroad (or each grand division of a railroad) shall report daily by wire to the regional coal committee, to be received not later than 9 a. m., information as to its coal situation for the twenty-four hours ending at 1 a. m. that day.

Daily Summary of Work

"11. Each regional coal committee will report daily by wire to the central coal committee, as promptly as information is available, a summary of the coal situation for the twenty-four hours ending at 1 a. m. that day.

"12. Applications to regional coal committees for delivery of coal to commercial consumers must be made through the railroad which will make delivery of the coal; such applications must show complete and accurate information with respect to the preferred nature of the requirements, the amount of coal which the applicant has on hand, and the amount which the applicant requires for the preferred use, together with the rate of consumption and the kind and size of the coal desired, all as set forth in form C attached hereto.

"13. Each regional coal committee will apply a consecutive number to all orders authorizing the delivery of coal and compliance with such orders must be reported promptly by the railroad to the regional coal committee.

Manner of Payment

"14. Coal diverted for commercial uses shall be paid for in accordance with the fuel administrator's order dated Jan. 14, 1918. In order to insure payments coal shall be diverted for commercial use to such applicants only who shall satisfy the federal or general manager of their financial responsibility or who shall deposit a certified check or other satisfactory security in such sum that will insure full payment for any coal furnished. The applicant shall make definite written obligation to pay the shipper for the coal promptly upon presentation of the bill. The legal transportation charges, including war taxes, from mines to point of delivery to the applicant, will be collected on delivery in the usual way."

There seems to be some question as to just how far the above rules will be made to apply, depending of course on how scarce coal becomes. But rock products operators certainly ought to protest on general principles.—Editor.

Middle West Lime Manufacturers Perfecting Organization

National Lime Association Will Not Lack Support in Districts 7 and 12

A CRISIS in the affairs of the recently reorganized National Lime Association was happily disposed of at St. Louis, October 28. The occasion was a meeting of Middle West lime manufacturers to consider their future course toward an organization which has been radically changed in spite of their best judgment and wishes to the contrary.

President Charles Warner of the National Lime Association was there to explain the changes in, and the purposes of, the National Association; and many difficulties and irritations were smoothed out—temporarily at least. The Middle West group will remain loyal to the National organization and do everything in their power to give it a fair and honest trial—but they are far from convinced that the reorganization was dictated by the best interests of the lime industry.

It was decided to combine the promotional efforts of Districts Nos. 7 and 12, but no final action was taken on the methods of carrying out the plan or the amount of dues to be paid. A special committee on organization and budget of five members, of which Bernard L. McNulty, of the Mitchell Lime Co., Chicago, is chairman, was appointed to work out these details. This committee will probably report in a few weeks and another general meeting will be held. The headquarters of the two districts will probably be established at St. Louis.

The membership of District No. 7 elected Col. C. W. S. Cobb, president of the Glencoe Lime and Cement Co., St. Louis, and Bernard L. McNulty, directors to represent the district on the board of directors of the National Association. The director elected to represent District No. 12 is J. F. Pollock, secretary-treasurer of the Ash Grove Lime & Portland Cement Co., Kansas City, Mo.

There were also present at the meeting J. M. Gager, Franklin C. Cheney and J. H. Childs, representing Districts Nos. 10, 11 and 13, respectively.

Associated General Contractors Ask Material Men's Co-operation

THE SECRETARY of the Associated General Contractors of America has appealed to material and machinery men to desist from furnishing highway contractors and engineers with alleged cost data. Apparently the chief offenders are contractors' equipment manufacturers, who, in their zeal to sell their stuff, balk at few claims, no matter how preposterous.

The matter is of interest to material men because their interests are identical with those of reputable contractors. The practice of equipment manufacturers which the Associated General Contractors object to is equally injurious, in many instances, to the interests of the material man, by inducing the inexperienced contractor to buy and set up portable quarry or gravel plants through unjustified claims of the cost of their operation.

Also, the material men themselves are working against their own best interests when they furnish highway engineers and contractors misleading cost data about their own or their competitors' material. They are thus encouraging the fly-by-night type of contractor, who is not a good or a safe customer. A part of the letter of the Associated General Contractors' secretary, which covers this point, reads as follows:

Gentlemen:—

You are anxious to push highway construction, of course; the more miles of road let at fair prices next year, the better pleased you will be. For this reason, if for no other, I am sure I can count on your aid in removing one big hindrance to placing large quantities of work under contract, and upon your assistance in attracting high grade contractors to highway work.

Our members who build roads in a big way tell us that they are handicapped in securing profitable work—and others who might enter the highway field stay out—because of the low estimates that frequently have limited the prices at which contracts could be awarded, and because of the precedents established by ill-advised bidders.

These highway contractors feel that the low cost figures spread abroad by various machinery manufacturers are to a large degree responsible for many of these low estimates, particularly when costs based on an exceptional performance are incorporated into a detailed estimate for another very dissimilar job, and overhead and contingencies are not properly cared for. We realize that no intentional misrepresentations are made, but figures that cause a lot of trouble are sometimes given to an inexperienced engineer or contractor who has not the judgment to use them properly.

In our opinion, equipment and material representatives should refrain entirely from supplying an engineer or contractor with detailed estimates of cost.

New England Lime Manufacturers Organized

A MEETING of the members of the National Lime Association in District No. 1, which includes all the New England States, met in New York City, October 28, and organized as a part of the Eastern Bureau of the National Association. Special dues of 5 cents per ton were voted for promotional work. George B. Wood, president of the Rockland and Rockport Lime Co., Rockland, Me., and A. N. Griffing, vice-president of the New England Lime Co., Danbury, Conn., were elected directors of the National Lime Association.

Sand and Gravel Production Is Limited by Supply of Cars

RESTRICTIONS against the loading of open-top cars with other commodities than coal were lifted on roads in the Western Region on the 29th, but there was no change on other roads until the 31st, after instructions had been sent out from Washington. None of the plants has, as yet, been able to obtain full requirements, largely because so many cars placed in coal service have not been released; but carriers claim they are making every effort to have coal moved and unloaded.

Regional Directors Aishton and Holden do not anticipate embargoes or restrictions against the handling of building materials as a result of the coal strike. Superintendent of Transportation Porterfield, of the Illinois Central, has also said his road would handle all traffic.

Regardless of what may be thought as to whether or not circumstances justified the recent car order, sight should not be lost of its effect on the industry. The two weeks' enforced idleness brought heavy financial losses to producers, contractors, and to labor in the construction field. It has served to emphasize the fact that production is measured very largely by car supply.

It probably could not have happened as it did had the railroads been under individual management. But however that may be, considered in connection with other experiences of the present year, it clearly demonstrates that the carriers are not equipped to handle the open-top car traffic of the country. It is obvious that something must be done to correct this condition of affairs if the enormous construction program which is ahead of us is to be carried out successfully. Having full knowledge of our needs and requirements, with the proper direction of effort we should be able to convince the carriers that additional equipment must be provided.—Ben Stone, Executive Secretary; Chicago Sand and Gravel Producers Association.

NEW MACHINERY AND EQUIPMENT

Silica Sand Grinding and Washing Equipment

THE STEVENSON CO., Wellesville, Ohio, which has manufactured clay-working machinery for fifty years, has just placed on the market a new line of machinery for washing and grinding silica sand. G. W. Stevenson, president of the company, is also president of the National Silica Co., Oregon, Ill., and the machinery herewith described was developed to meet practical conditions in the silica sand industry.

The washing and separating machine is a development of the twin-screw, or log, washer, which is quite universally used in the glass sand industry. This machine is a departure from the usual practice in that the two screws are a unit, driven from a single electric motor through worm gears encased in oil baths, in place of the ordinary gear and pinion drive.

The use of an iron tank in place of wood gives the unit rigidity and keeps the various parts in alignment. The chutes are designed to be lined with concrete.

The screw flights are usually one thread per foot. The screws turn in opposite directions so that the load on the drive shaft is balanced. The regular size of these washers is in size of tank, length inside measure, 14x4 ft., with double flight shafts having 20-in. diameter blades. Any size, however, may be made.

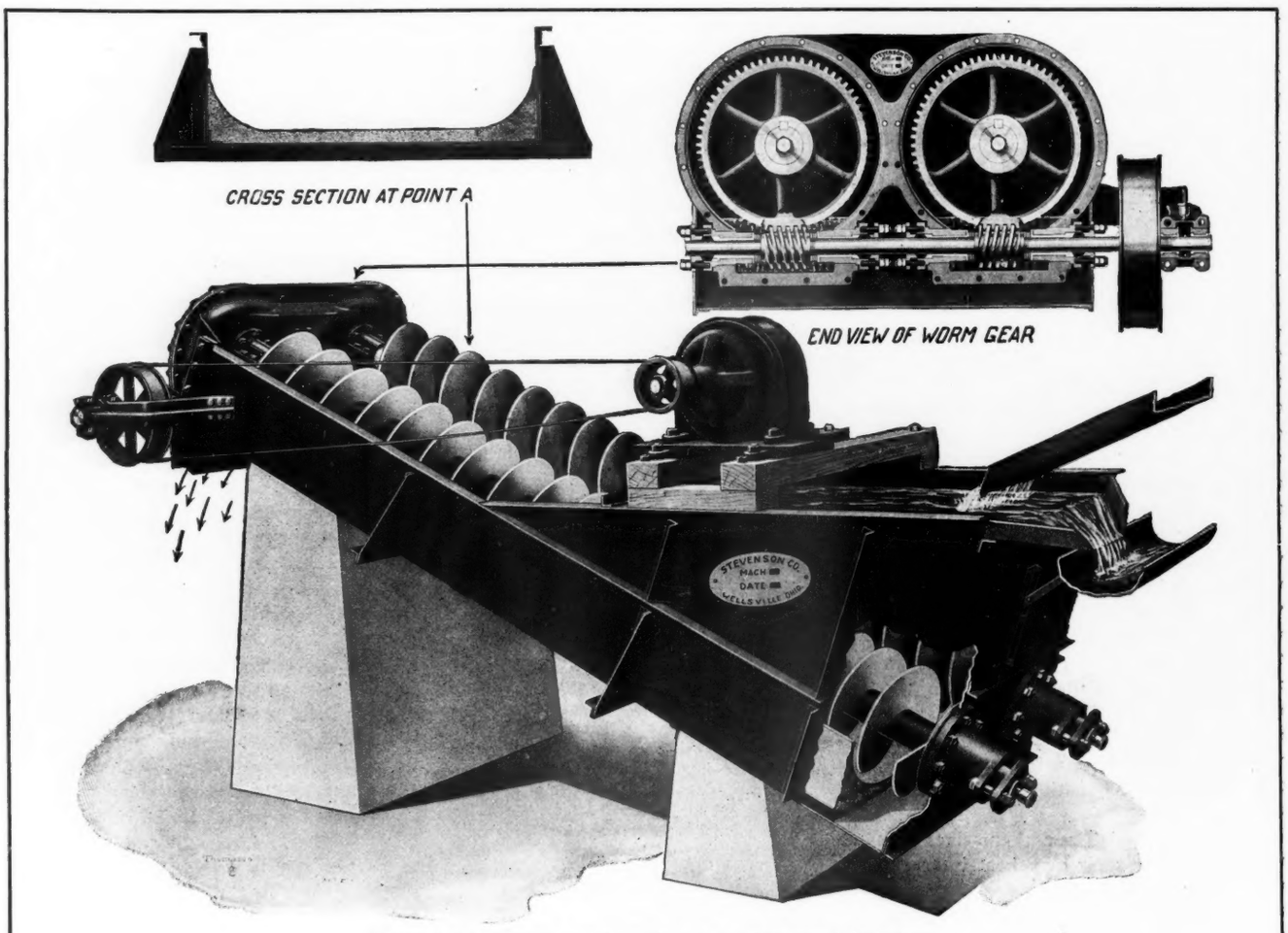
Grinding Machine

The grinder or pulverizer is a development and improvement of the well-known "chaser" mill—one of the first grinding machines invented, and to this day one of the most efficient. This grinder, like the washer, is a unit with individual electric motor drive.

The milling wheels, or "stones," are cast iron, with special chilled iron, replaceable treads. The machine is made both for wet and dry grinding. For silica sand the wet grinding process is ordinarily used, and the machine not only grinds but washes and screens the material.

A typical dry grinding installation, such as could be used for agricultural limestone, is shown in the accompanying view, which includes also a single-roll crusher as a primary or secondary crusher.

These grinders are made in sizes up to 15 ft. in diameter, with seven milling-wheel arms and a capacity of 1,000 tons

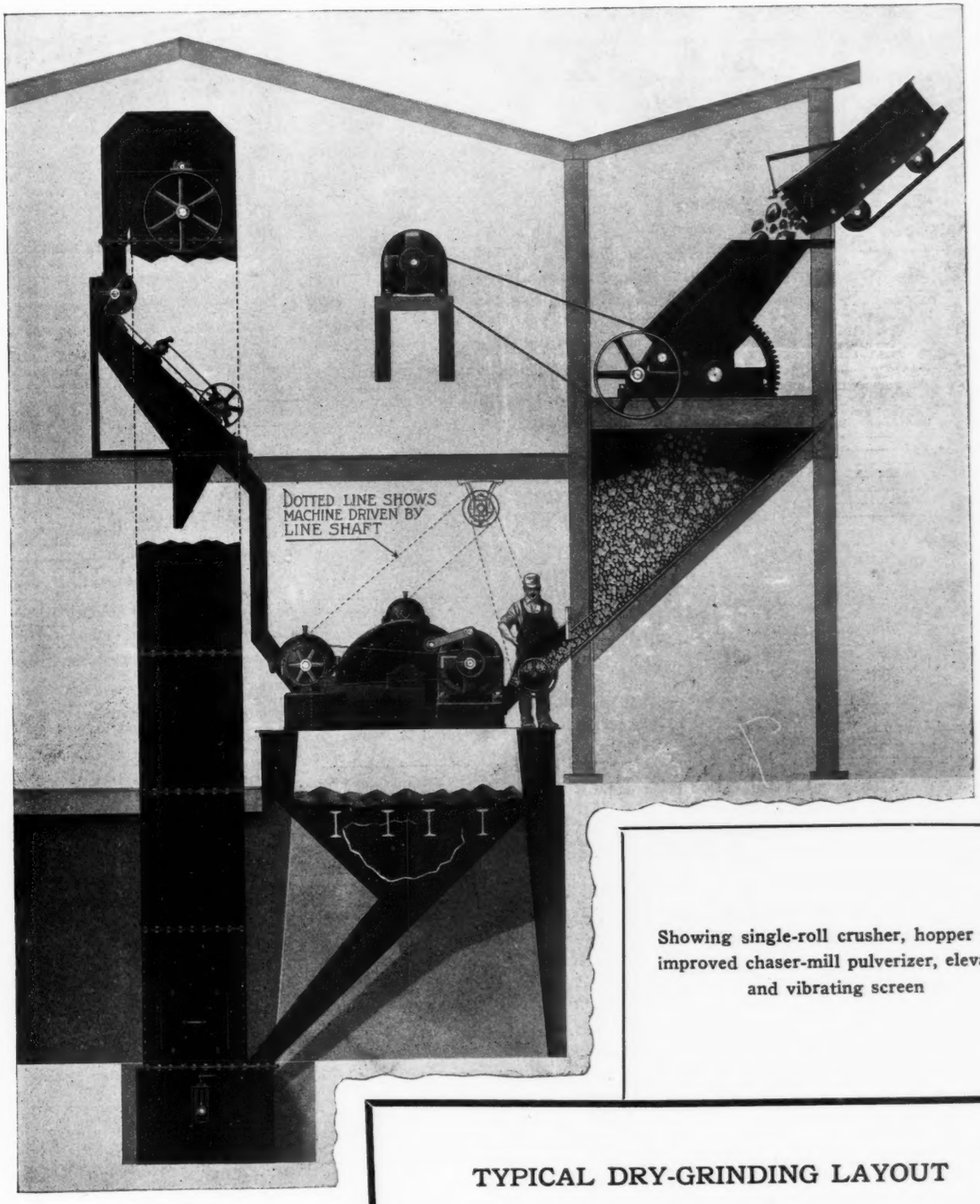


New double-screw sand washer for glass-sand industry

per day of pulverized material. The horsepower required for this output is claimed to be about 75.

When direct connected to an electric motor the smaller sizes of grinder are driven by a flexible coupling between the motor and the intermediate gear drive to absorb shocks and prevent motor troubles from back lash in gears, which can not be entirely prevented. This flexible coupling takes up the shock and protects the motor in the same way as does a belt drive, which is used in the installation shown below.

The milling wheels, or rolls, revolve on arms attached to the main vertical shaft, which is used for both pivot and suspension purposes. This suspension and pivot shaft is provided with dust-proof, adjustable and babbitted bearings. The roll axles, or shafts, are tapered on both ends and the rolls are held in place and alignment by circular split wedges which are drawn together by through bolts. All shafts and moving parts have dust-proof boxings and are provided with grease cups.



Showing single-roll crusher, hopper and improved chaser-mill pulverizer, elevator and vibrating screen

TYPICAL DRY-GRINDING LAYOUT

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton. F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Burlington, Vt.	1.00	.....	2.75	1.75	1.75	.....
Chaumont, N. Y.	.....	1.75	1.65	1.35	1.25	1.25
Coldwater, N. Y.			Flux, 1.50@2.10			
Limekiln, Md.	.75	1.85	1.65	1.50	1.25	1.10
North Leroy and Akron, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00‖
Pittsburgh, Pa.	1.25	1.40	1.50	1.50	1.50	1.50
Walford, Pa.	1.25	1.40	1.50	1.50	1.50	1.50
CENTRAL:						
Alton, Ill.	1.80	.....	1.40	1.35	.....	.....
Anna, Ill.			1.00@1.25 for prepared sizes			
Brillion and Sherwood, Wis.	.90@1.00	.....	1.00	1.00	.....	1.00
Buffalo, Ia.	.80	1.20	1.10	1.00	1.00	.....
Chicago, Ill.	.90@1.00	1.50	1.00	1.00	1.00	1.00
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*	.....	.....
Dresser Junction, Wis.	.50	1.75	1.75	1.55	1.50	1.50
Dundas, Ont.	.65	1.20	1.20	1.20	1.00	1.00
Eden and Knowles, Wis.	1.00	1.00	1.00	1.00	1.00	.....
Elmhurst, Ill.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Greencastle, Ind.	1.25	1.10	1.00	.90	.90	.90
Hull, Canada	2.50	2.75	2.75	2.25	2.00	1.75
Illinois, Southern	2.00	1.35	1.35	1.25	1.25	.....
Kokomo, Ind.			.90@1.00 all sizes			
Mayville, Wis.	.75@ .85	1.00	1.00	1.00	1.00	1.00
Moline, Ill.			1.50—2300 lbs. all sizes			
Montrose, Ia.	1.25	1.15@1.25	1.15@1.25	1.10@1.25	1.10@1.15	.....
Oshkosh, Wis.			1.00 per ton, all sizes			
Ottawa, Ont.	2.50	2.75	.....	2.25	2.00	.....
River Rouge, Mich.	.95	1.15	1.15	1.15	1.15	1.15
Sheboygan, Wis.			1.00 to 1.25 all sizes			
Stolle, Ill.	.....	1.30	1.30	1.30	.....	.....
Stone City, Ia.	.50	.....	1.40	1.30	1.20	.....
Toronto, Canada	1.55	2.10	2.10	2.10	1.90	1.90
SOUTHERN:			These prices include 90c freight			
Brooksville, Fla.	1.00	.....	.....	2.60	.....	.....
Cartersville, Ga.	.....	1.95	.....	1.85	1.75	.....
Fort Springs, W. Va.	1.00	1.15	1.60	1.50	1.45	.....
Irvington, Ky.	.....	.....	1.00	1.00	1.00	1.00
Mascot, Tenn.	.....	1.00@1.25	.....	1.50	1.50	.....
Memphis Junction, Ky.			Average 1.10			
Winnfield, La.	.80	1.80	1.80	1.80	1.80	1.80
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.70	1.70
Blue Springs and Wymore, Neb.	.20	1.65	Rip-Rap, 1.30 1.65	1.55	1.45	1.40
El Paso, Tex.			1.00 for all sizes			
Kansas City, Mo.	1.00	1.60	.....	.....	.....	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bound Brook, N. J.	1.00@1.10	2.00	1.80	1.70	1.50	.....
Branford, Conn.	.80	1.50	1.50	1.20	1.10	.....
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Castro Pt., Richmond, Cal.	.50*	.....	1.50*	1.50*	1.40*	.....
Duluth, Minn.	.50@.65	1.50	1.35	1.15	1.15	1.00
Farmington, Conn.	.....	1.05	1.05	1.05	.95	.....
Glen Mills, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Little Rock, Ark.	1.75	2.50	.....	2.00	1.50	1.35
Millington, N. J.	1.80	1.80	1.80	1.60	1.00	.....
New Britain, Conn.	.80	1.30	1.25	1.20	1.00	.....
Oakland, Calif.	.....	1.75*	1.75*	1.75*	1.75*	.....
Rock Hill, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Westfield, Mass.	.60	1.20	1.10	1.00	.90	.80
Winchester, Mass.	.75	.75	1.60	1.45	1.25	1.25‖

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Hendlers, Pa.—Quartzite	.80	1.00	1.25	1.00	1.00	1.00‖
Little Falls, N. Y.—Syenite	.80	1.20	1.40	1.20	1.20	1.20‖
Middlebrook, Mo.—Granite	3.50	.....	1.75	1.75	.....	1.00‡
Portland, Maine—Granite	1.50	.....	.....	1.35	1.25	.....
Roseburg, Ore.	.....	1.50	1.25	1.05	1.00	1.00
Redington, Pa.—Dolomite	1.00	1.10	1.10	1.10	1.10	1.10‖
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	.....
White Haven, Pa.—Sandstone	.85	1.20	1.40	1.20	1.20	1.20‖
Granite	1.25	.....	1.50	1.50	1.50	.....

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. †Rip-rap. a 3-inch and less.

Agricultural Limestone Wholesale at Plant, per Ton

EASTERN:

Coldwater, near Rochester, N. Y.—Analysis: $CaCo_3$, 56.77%; $MgCo_3$, 41.74%—80% thru 100 mesh; ppr., 4.50; bulk	3.00
Chaumont, N. Y.—Analysis: $CaCo_3$, 92 to 98%; $MgCo_3$, 1.51%—(Thru 100 mesh); ppr., 4.00; bulk	2.50
Paper bags	4.00
Cobleskill, N. Y.—Ppr., 5.00; bulk	3.00
Grove City, Pa.—Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 4.60; bulk	3.25
Grove, Md.—90% thru 4 mesh; bulk	3,00
Hillsville, Pa.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 1½%—(70% thru 100 mesh) in 80 lb. ppr. bags, 4.25; bulk	2.75
Jamesville, N. Y.—68% thru 100 mesh; 95% thru 50; 100% thru 20. Sacks, 3.75; bulk	2.25
Lime Kiln, Md.—50% thru 50 mesh; bulk	4.00
Pownal, Vt.—(50% thru 100) Analysis, $CaCo_3$, 90%; $MgCo_3$, 5%; ppr., $4.50; bulk	2.75
Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk	2.75
West Stockbridge, Mass. — Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk	2.85
Williamsport, Pa. — Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh)	3.00@4,50

CENTRAL:

Alton, Ill.—Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—90% thru 100 mesh..	3,00
50% thru 50 mesh	2.00
Anna, Ill.—Ground; bulk	1.25
Bedford, Ind.—(90% thru 10 mesh) Analysis, $CaCo_3$, 98.5%; $MgCo_3$, 0.5%	1.75
Canton, O.—50% thru 100 mesh; bulk	3.00
Bags	4.50
Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh	1.00
Columbia, Ill., near East St. Louis —(⅛" down)	1.25@1.80
Ellettsville, Ind.—Analysis, Carbonate, 98%	2.00
Elmhurst, Ill. — (Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh	1.25
Greencastle, Ind.—(Analysis, $CaCo_3$, 98%) 50% thru 50 mesh	1.75
Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100	2.75@3.00
Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$	2.00
Marble Cliff, O.—(50% thru 100 mesh) Analysis, $CaCo_3$, 86%; $MgCo_3$, 8%..	2,50
Marblehead, O. — (Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 4.50; bulk	2,50
McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04% — 100% thru ¼" sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 26.04% thru No. 50; 16.27% thru 100	.90@1.00
Milltown, Ind.—Analysis, $CaCo_3$, 94%; $MgCo_3$, 3%	1.50
Monon, Ind.	1.25
Montrose, Ia.—(90% thru 100 mesh)..	1,25
Mountville, Va.—Analysis, $CaCo_3$, 76.6%; $MgCo_3$, 22.8%—30% thru 100 mesh; 100% thru 20 mesh	4.00
Muskegon, Mich.—(90% thru 50 mesh) Analysis, $CaCo_3$, 53.35%; $MgCo_3$, 43.27%	2.50
Piqua, O.—Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—70% thru 100 mesh, bulk	2.50@4.00
Rockford, Ill. — Analysis, $CaCo_3$, 53.75%; $MgCo_3$, 44.35%	1.25
Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ⅛" mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82%	2.00

(Continued on next page.)

Agricultural Limestone Wholesale at Plant, per Ton

(Continued from preceding page.)

St. Paul, Ind.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 12%	1.50
Stone City, Ia.—Analysis, $CaCo_3$, 98% (90% thru 50 mesh)	.50
Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh; 30% thru 50; 80% thru 100; 100% thru 5/32 screen)	1.80
Whitehill, Ill. — Analysis, $CaCo_3$, 96.12%; $MgCo_3$, 2.50%—	
90% thru 50 mesh, bulk	2.00
90% thru 100 mesh	5.00
SOUTHERN:	
Brooksville, Fla.—50% thru 50 mesh	2.80
Cartersville, Ga.—Analysis: 96 to 98% combined carbonates—All thru 10 mesh with all dust in	2.50
Dittlinger, Tex. — Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%.	
90% thru 100 mesh	2.00
90% thru 4 mesh	1.00
Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh	3.25
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk	2.00
Irvington, Ky.—(90% thru 50 mesh)	2.00
Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%) average price	2.00
Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.	
(80% thru 100 mesh)	2.50
(All thru 10 mesh)	2.00
80% thru 200 mesh	3.50
Paper bags, $1.50 extra per ton; burlap, 2.09 extra per ton.	
Maxwell, Va.	2.50
Ocala, Fla.—Analysis, $CaCo_3$, 98%—(75% thru 200 mesh)	4.50
Tyrone, Ky.—Analysis, $CaCo_3$, 93%; $MgCo_3$, 6%—90% thru 4 mesh	2.25
Winnfield, La.—(50% thru 50 mesh)	3.00
WESTERN:	
Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½%; bulk	2.50
Fresno, Calif.—(Analysis, $CaCo_3$, 94%; $MgCo_3$, .02%) 50% thru 200 mesh; 90% thru 100; 100% thru 40. Prices for delivery: Sacks, 6.50; bulk Sacks, 10c each.	6.00
Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk	1.35

Miscellaneous Sands per Ton at Plant

Silica sand is quoted washed, dried and screened, unless otherwise stated.

GLASS SAND:	
Berkeley Springs, W. Va.	2.00@2.10
Special hand selected rock	2.50
Cedarville and South Vineland, N. J.—	
Glass, damp	2.00
Glass, dry	2.50
Gray Summit, Mo.	2.00@2.50
Guion, Ark.—Contracts	1.50
Carlots	2.50
Hancock, Md.—Engine and glass	2.50@3.00
Klondike and Pacific, Mo.:	
Contracts	2.00
Car lots	2.50
Mapleton, Pa.	2.50
Glass, damp	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.30@ .40
Millington, Ill.	1.75
Mineral Ridge, O.	2.75
Montoursville, Pa.—Green, washed	2.75
Oregon, Ill.	1.75@2.00
Ottawa, Ill—Without contracts	2.00
Large contracts	1.75
Robinson, Md., washed, screened, not dried	2.00
St. Marys, Pa.—Green	2.50
Sands, Elk Co., Pa.—Selected, green	2.50
Thayer, W. Va.—Washed	2.25
FOUNDRY SAND:	
Albany, N. Y.—Core	1.25@2.00
Molding fine, furnace lining	2.00
Molding coarse	1.80
Brass molding	2.00
Sand blast	1.50@3.50
Allentown, Pa.—Core	1.25@1.50
Arenzville, Ill.—Molding fine	1.50
Bowmanstown, Pa.—Core	1.25
Molding fine or coarse	1.50
Traction	1.25
Cedarville and So. Vineland, N. J.—	
Core, damp	2.00
Core, dry	2.50
Cleveland, O.—Core	1.00@1.50
Molding fine, molding coarse	1.75@2.25
Brass molding	1.50@2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.		1.00		1.00	.80	.80
Attica, N. Y.	.65	.65	.65	.75	.75	.75
Boston, Mass.	1.65	1.10	2.25	1.75	1.75	1.60
Farmingdale, N. J.		.43	1.25	1.15	1.05	
Morristown, N. J.	.60	.60	1.20	1.00	1.00	
Washington, D. C.—Wharves	.75	.75	2.00	1.40	1.20	1.20
West Peabody, Mass.	.35@ .45	.35@ .45	2.00	1.20	1.20	1.20
CENTRAL:						
Alton, Ill.	.75	.75		1.35	1.20	1.20
Attica, Covington, Silverwood, Ind., Palestine, Ill.	.75	.75	.75	.75	.75	.75
Barton, Wis.	.75	.70	1.00	.70	.70	.70
Chicago		1.25@1.50	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Columbus, O.		.65@1.00	1.00	.70@1.00	.70@1.00	.65@1.00
Des Moines, Ia.	.60@1.00	.60	1.50	1.50	1.40	1.40
Earlestead, near Flint, Mich.		.65@ .75			.85@ .95	.85@ .95
Escanaba, Mich.		.90	1.60	1.20	1.00	.90
Grand Rapids, Mich.	.75@ .85	.60@ .75	1.25@1.35	1.15	1.00	1.00
Hersey, Mich.	.50			1.00	1.00	
Illinois, Northern	.50@ .60	.60@ .70	.75	.60@ .75	.60@ .75	.60@ .70
Indianapolis, Ind.	.60	.60		1.50	.75	.75
Janesville, Wis.		.60			.60@ .70	
Mason City, Ia.	.70	.60	1.60	1.50	1.50	1.40
Milwaukee, Wis.			1.20 for all sizes			
Minneapolis, Minn.	.50	.50	1.75	1.75	1.50	1.50
Moline, Ill.	.60	.60	1.10	1.00	1.00	1.00
Oxford, Mich.					.85	
Rockford, Ill.	.60		.75	.75	.75	.75
Saginaw, Mich. (River Sand)	1.05	1.05	1.85	1.60	1.60	1.45
St. Louis, Mo., F. O. B. cars	1.35	1.20	1.50	1.30		1.25
St. Louis, Mo., city delivered	1.90	1.90	2.20	2.00	2.00	1.95
Summit Grove, Ind.	.75					
Winona, Minn.		.70	1.60	1.10	1.10	1.10
Yorkville, Moronts, Oregon and Ottawa, Ill.	.75	.75	.75	.75	.75	.75
SOUTHERN:						
Knoxville, Tenn.	.85	.85	.85	1.50	1.50	1.25
Lake Weir, Fla.		.50				
Macon, Ga.		.75@1.00				
New Martinsville, W. Va.	1.30	1.00@1.10		1.20		.70@ .80
Roseland, La., and Condron, Miss.		.50		1.00		
Thomas, La.	.60					1.75
Valde Rouge, La.		.80				1.25@1.50
Waco, Texas.		.70			1.10	1.10
WESTERN:						
Kansas City, Mo.	.60	.60	(Kaw river sand .60 per ton carlots)			
Lincoln, Neb. (on cars)	1.00	1.00	2.10	2.10		1.90
Pine Bluff, Ark.	1.00	.90			1.30	
Pueblo, Col.	.80*	.60*		1.50*		
Roseburg, Ore.	1.50	1.00	1.00	1.00	1.00	1.00
San Francisco, Cal.	1.25	1.25	1.50	1.15	1.15	1.15
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Seattle, Wash.	1.25*	1.25*	2.00*	1.25*	1.25*	1.25*
Vancouver, Wash.		1.10*		1.30*		1.10*
Yorkville, Ore.	.60	.60@ .75	.70	.60@ .75	.60	.50@ .60

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60	.50@ .65				.65
Burnside, Conn.	.80*					
Lowell Junction, Mass.	.75*	.65*@.75*	.60*			
Yardville, N. J.		.50@ .75				
York, Pa.		.80@1.10	(crushed rock sand)			
CENTRAL:						
Attica, Covington, Silverwood, Ind., Palestine, Ill.	.60	.60	.60	.60	.60	.60
Des Moines, Ia.	Washed concrete mix., 25% gravel, .80; 50% gravel, 1.00					
Earlestead, near Flint, Mich.	.55@ .65					
Escanaba, Mich.			1.00 cu. yd., all sizes			
Grand Rapids, Mich.	.60			.75		.60
Hersey, Mich.	.40			.50	.50	.50
Illinois, Northern						.50@ .60
Indianapolis, Ind.	Washed concrete, mix, .65					
Janesville, Wis.					.55	
Montezuma, Terre Haute, Ind.					.60	.60
Oxford, Mich.					1.00	
Rockford, Ill.	Sand and Gravel mixed, .55@.65					
Saginaw, Mich. (Incldg. frt.)	1.05	1.05	1.20	1.20	1.20	1.20
St. Louis, Mo.						1.40
Summit Grove, Ind.	.50					
Wabash Valley District, Ind.	.60 for all sizes					
Winona, Minn.	Pit run gravel under 2-in., .70					
Yorkville, Moronts, Oregon and Ottawa, Ill.	.60					
SOUTHERN:						
Albany, Ga.	.70@1.00					
Dudley, Ky. (Crushed Sand)	.95	.90		1.00		
Knoxville, Tenn.	.85	.85	.85	1.50	1.50	1.25
Lindsay, Texas		1.50			.50	
Pine Bluff, Ark. (Road Gravel)					.45	
Thomas, La.						.40@ .70
Valde Rouge, La.						.60@ .75
Waco, Texas						.67
WESTERN:						
Pueblo, Col.		.60*	River Run, .60 unscreened			
Roseburg, Ore. (crushed stone)	2.00			1.25	1.25	1.00
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Yorkville, Ore.		.40			.40	

* Cubic yard. B Bank. L Lake. ‖ Ballast.

Crushed Slag Wholesale at Plant Per Ton

City or shipping point	Roofing	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Buffalo, N. Y.	1.75@2.00	.85	.85	.85	.85	.85	.85
Cleveland, Ohio.		.85		1.05	1.05	.95	.95
E. Canaan, Conn.	4.00	1.00	1.50	1.25	1.10	1.10	1.10
Erie, Pa.	1.75	.85@1.00	1.00@1.50		1.00	1.00	1.00
Emporium, Pa.		1.00	1.00		1.00	1.00	1.00
Ensley, Ala.	2.05	.90		.90@1.20	1.00	.90	.85
Hokendaugua and Topton, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Lebanon (Donaghmore), Pa.	2.50	.85	1.50	.85	.85	.85	.85
Philadelphia Dist.	2.50	.75	1.50	.85	.85	.85	.85
Pittsburgh, Pa., Dist.	2.05	1.10	1.50	1.10	1.10	1.10	1.10
Sharpsville, Pa.	1.75	1.00	1.25	1.00	1.00	1.00	1.00
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton and Jackson, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Toledo, O.	All sizes, 2.00, F. O. B. Toledo						
Youngstown, Sharpsville, Hubbard, Leetonia, O.	2.00	1.10	1.50	1.10	1.10	1.10	1.10

Agricultural Lime and Hydrate at Plant Per Ton

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.		7.50@8.00	65		
Berkeley, R. I.		16.00	45	15	
Bellefonte, Pa.	**7.25**		**95.5**	**.72 to .89**	
Bridgeport, Pa.	7.50		55	44	10.50
Cavendish, Vt.	2.50 bbl. in car lots				
Cavetown, Md.	**8.50**				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	8.00	10.75 grd.	58	38	10.75
Chippewa, Lycoming Co., Pa.	5.00@5.50		78.67	1.33	
Espy, Pa.	**4.50**		82	**1.25**	
Farnams, Mass.	5.00	7.50			
Frederick, Md.	7.75		88	5 to 8	10.50
Grove City, Pa.	7.00 Imp.	9.00 grd.	75.48	0.80	10.00
Grove, Md.	8.00				**10.75**
Highgate Springs, Vt.		8.00	85	2	
Hollidaysburg, Pa.	6.50		94.25	.30	
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Bluff, Pa.	**5.00@6.25**		**78.67**	**1.33**	
Lime Kiln, Md.	8.00	10.75			10.75
Lime Ridge, Pa.	5.00@6.25		80.56 to 62.56	3.87 to 1.75	
Mt. Union, Pa.	4.25		94.6		
Newburgh, N. Y.			57	38	8.00
New Castle, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Ottawa, Ont.	**12.00**		**95**	**1.5**	
Paxtang, Pa.	5.00		60	12	
Rosedale, N. Y.	8.00		96	5	(Bulk, 6.00)
Sandville, O.					9.00
Steuben, Pa., Dover Plains, N. Y., York, Pa.		7.00@9.50	70		10.75 to 12.00
Union Bridge, Md.	8.50		73	1	10.75
West Rutland, Vt.	**5.00**	**7.50**	**68**	**3**	**10.00**
Williamsport, Pa.	5.50	10.00	65 to 80	2 to 4	10.00
Williams Station, Pa.	**7.50**		60.6	39.1	9.75@10.50
York, Pa.	8.00		90 to 95	2 to 7	10.75
Zylontte Station, Adams, Mass.		**8.00**			
CENTRAL:					
Alton, Ill.	10.90		94.0		
Delaware, O.			50	9	9.75
Forest, O.	**7.50**				
Manistique, Mich.		10.00	54 & 95	40 & 1.75	10.00
Marblehead, Ohio			54	16.0	9.75
Mitchell, Ind.	**9.00**				**11.00**
Springfield, O.			**33.62**	**17.73**	**9.00**
Woodville, Ohio		9.25	46 to 48	30 to 34	9.25
SOUTHERN:					
Blowers, Fla.	5.00	7.25	98.0		
Burns, Tenn.	8.00		96	0.54	11.50
Chippewa, Fla.	5.00		80.0	15.0	
Erin, Tenn.	8.00		97		
Karo, Va.	8.00		97.0	1.26	
Lineton, Va.	8.50		97	1.74	
Louis Brook, Va.	8.00	10.25	90	1	
Lushing, Va.	9.00	11.25	60	15	12.75
Maxwell, Va.	5.00		84	1.75	
Newala, Ala.	**8.50@9.00**		**99.33**		
Ocala, Fla.	**4.00**	**6.00 pulv.**	**98½ (dry basis)**		
Staunton, Va.	6.50	9.00	93	5.5	
WESTERN:					
Bellins, Wash.					**12.00**
Colton, Calif.	4.50		95 to 97	1.5 to 3.0	
Dittlinger, Texas		9.00@11.00	98.62	0.29	12.50@15.00
Kirtland, N. M.	10.00				
Knowles, Wis.	8.00	9.50	55	45	9.50
Lime, Ore.	**15.00**		91.48	0.58	
Oscas Island, Wash.		5.50			16.50
San Francisco, Calif.					15.00
Tehachapi, Cal.	**6.00**	**8.00**	**96**	**2**	

Miscellaneous Sands per Ton at Plant

(Continued from preceding page)

Delaware, N. J.—Molding	1.50@2.00
Dundee, Ohio—Molding, steel	**1.75**
Eau Claire, Wis.—Core	**2.25**
Roofing sand	3.00
Brass molding and sand blast	2.25
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa.—Traction and brass molding	2.00
Molding fine, steel molding	2.00
Molding, coarse	1.50@1.75
Sand blast	3.50
Core	2.00
Klondike and Gray Summit, Mo.—Molding fine	1.50@2.50
Greenville, Ill.—Molding coarse red	1.60
Guion, Ark.—Filter	2.50
Hancock, Md.—Core and brass mldg.	1.65
Hellam, Pa.—Core	2.00
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.85
Leesburg, Pa.—Core, furnace lining, molding fine and coarse	2.00
Mapleton, Pa.—Molding, fine and core, damp	2.00@2.50
Molding, fine, dry	3.00
Massillon, O.—Steel molding coarse	**2.50**
Molding fine	3.00
Molding coarse	2.50
Traction	2.50
Furnace lining	**3.00**
Core	**2.50**
Michigan City, Ind.—Core, bank	.30@.50
Millington, Ill.—Furnace lining, roofing, stone sawing	1.75
Core	1.50
Mineral Ridge, O.—Core, molding, sand blast, roofing, brass molding, etc., washed, screened (damp)	2.10
Montoursville, Pa.—Core, molding fine, traction, brass molding	1.25@1.75
Ohio—Various points:	
Iron molding, fine	**1.50@2.25**
Iron molding, coarse	**1.75**
Brass molding, minimum	2.00
Ottawa, Ill.—Sand blast	2.75
Core, furnace, steel molding	2.00
Roofing sand	2.00@3.50
Stone sawing	1.75
Providence, R. I.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.25
Sand blast	3.00@4.00
Sugar Grove, Ohio—Core (dried and screened)	**2.00**
Traction	**2.00**
Thayers, Pa.—Core and traction	1.75
Furnace lining, molding	1.25
Utica, Pa.—Core	2.00
Molding coarse, steel	2.00
Traction	2.00
Brass molding	2.00
Warwick, O.—Core	2.25
Furnace lining, green	2.00
Molding fine	2.25
Molding, dried and screened	2.25
Green	1.75@2.00
Traction and brass molding	2.25
Wedron, Ill.—Core, (crude silica)	.75
Furnace lining, molding fine	.75
West Albany, N. Y.—Molding fine	1.75@2.25
Molding coarse	1.50
Brass molding	**1.75**
Zanesville, O.—Molding fine	1.50@2.00
Traction	.75
Molding coarse	1.25@1.50
Brass molding	1.50@2.00

Ground Gypsum Rock, per Ton, at Plant

Castalia, O.—Crushed, to cement mills	3.50
Ground, to cement mills	3.50
Land plaster	6.00
Fort Dodge, Ia., bulk	4.00
Garhutt, N. Y.—Land plaster, bags	7.00
Grand Rapids, Mich.—Crushed gypsum	7.00
Ground gypsum rock	9.00
Gypsumville, Man., Can.	**3.00**
Oakfield, N. Y.	7.00
Sandusky, O.	6.00

Jute sacks, $3.00 extra; paper, $1.00 extra.

Ground Rock Phosphate at Plant, per Ton

Centerville, Tenn.—B. P. L., 60% to 70%; ton, 2240 lbs. Ground rock phosphate (90% thru 100 mesh)	8.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centreville, Tenn.—B. P. L., 60%	7.00
B. P. L., 70%	**7.75@8.00**
B. P. L., 78%	**8.00**
Gordonsburg, Tenn.—B. P. L., 72%; ton, 2240 lbs. Ground 90% thru 100 mesh	7.00@9.00
Lump rock	6.00@7.50
Mt. Pleasant, Tenn.—(B. P. L., 68%) 12%	6.00
13%	7.00
14%	8.00
Mt. Pleasant, Tenn.—B. P. L., 60% to 70%	8.00@9.50
Nichols, Fla.—Pebble, B. P. L., 70%	10.00
Wales, Tenn.—B. P. L., 70%	**7.50@8.50**
Walls, Tenn.—B. P. L., 70.2%—	
To County Agri. Assns.	**7.50**
To others	**7.75**

Florida Soft Phosphate

Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00

(Add 2.50 for sacks)

Phoslime, Fla. (in burlap bags, 100-200 lbs.)	15.00
Benotis, Fla.	9.00@11.00

General News From the Rock Products Markets

Eastern Building Material Market Radical

WITH ALMOST every eastern building material dealer aligned with the consumer against further increases in the cost of construction commodities, and the manufacturers of at least several items entering into general building construction, already beginning to feel the stampede for supplies that has been expected since the armistice was signed, the eastern building material market presented the most paradoxical situation in its history on Saturday, says the Dow Service Daily Building Report.

The situation reached its climax when common brick attained a price of $18 a thousand, wholesale. There is no alternative but to pay this price, according to the dealers, because every New Jersey manufacturer is sold up on contract as well as the Long Island and Connecticut firms that normally are looked to in an emergency of this kind.

Dealers in building materials on Saturday frankly admitted that they would welcome a strike among the builders of New York in protest against such price level or some other such remedial measure that would help restore sanity in price quotation.

Current building material price lists show more actual changes in building material quotations than has featured the weekly compilation for more than a year. The only week that compares with it is in the spring of 1916. New quotations on hollow tile intimated in this column last week were not issued until Friday.

Inside information in the building material market on Saturday indicated that price advances were scheduled to develop at any time in lime, both common and finishing. In cut limestone there has been some stiffening in prices, generally about ten cents a foot, but other building stone holds steady at present, excepting granite, which is now selling on a scale from 85 cents to $6.60, which price was paid last week for good granite in the rough. Price advances are expected in the steel market, according to some authorities. There are important price changes upward expected in the lumber market.

It was explained that the reason for the unusual activity is to discount as possible any contingency that might arise in the form of a railroad trainmen's strike or other disturbance that would interfere with the normal flow of building material toward this market next winter and early spring.

AGSTONE DINNER

"AGSTONE" is both ends of agricultural limestone. The National Agricultural Limestone Association is going and growing. Annual meeting, Columbus, Ohio, November 18, 1919. A social dinner. New members and prospective members attending. Soil experts from agricultural colleges and experiment stations will be guests. County agents, farm institute lecturers and editors of agricultural limestone will soon claim front seat in crushed stone industry. Manufacturers of "Agstone" spreaders and other plant crushing grinding machinery will be invited.—A. P. Sandles, Secretary, National Agricultural Limestone Association, 405 Hartman Building, Columbus, Ohio.

Hydrated Lime for Making Calcium Carbide

A PATENT has been issued to Frank L. Slocum of Pittsburgh, Penn., for a method of preparing raw materials for the manufacture of calcium carbide. This method consists in mixing *hydrated lime* with ground bituminous coal and coking the same at a sufficiently high temperature to remove practically all the volatile matter in the coal, and the water of hydration in the lime, and briquetting the mass in suitable form for reduction in an electric furnace.

In the ordinary method of making calcium carbide quick lime and ground coke are used.

August Cement Export Report

WASHINGTON, D. C.—Exports of cement during the month of August amounted to 290,563 barrels, worth $845,930, according to a report just secured from the Washington Bureau of ROCK PRODUCTS from the Department of Commerce.

This total was divided among some forty countries, of which Argentina was the most important customer.

FIRST CONSUMER—Do you think the government ought to take over the coal mines?

Second Consumer—No, coal is high enough as it is.

Some Big Road Projects

AMONG THE SPECIAL FEATURES of the recent Federal Aid road record as kept by the United States Department of Agriculture are three road projects to cost over $1,000,000, one of them over $2,000,000. Pennsylvania had first place in the number of statements approved during July, the amount of Federal aid allowances, and the estimated cost of roads to be constructed, while Nebraska turned in the greatest mileage. Seventeen projects in Pennsylvania approved will cost $4,607,028.41 for which the Federal aid is $1,968,997.40. Ohio, with 12 projects, came next to Pennsylvania in the number approved and in the estimated cost of the roads to be improved, and third in the amount of Federal aid.

Oklahoma's two projects occupy third place for the month in the estimated cost of the roads and second in the amount of Federal aid allowance. This State leads the country in the size of a single project handled in July. It is estimated to cost $1,271,555.60, for which $600,000 Federal aid is allowed.

In the record of approvals for the month of August Arkansas occupies first place in the estimated cost and mileage of projects and in respect to the largest project. Minnesota is first in the total number of projects approved, namely, 11, and second in the amount of Federal aid allowances. Pennsylvania received the largest amount of Federal aid and her six approved projects come second in the estimated cost of the roads.

On a Massachusetts project, a short concrete road, the estimated cost is at the rate of $127,864 a mile. This is the highest average cost per mile so far shown in any Federal aid road. A bituminous brick or concrete road in Ohio will average $67,716 a mile and 7.14 miles of concrete or brick in Pennsylvania will average $64,015, while another project in Pennsylvania will average $56,443 per mile.

Indiana Sand and Gravel Prices Low

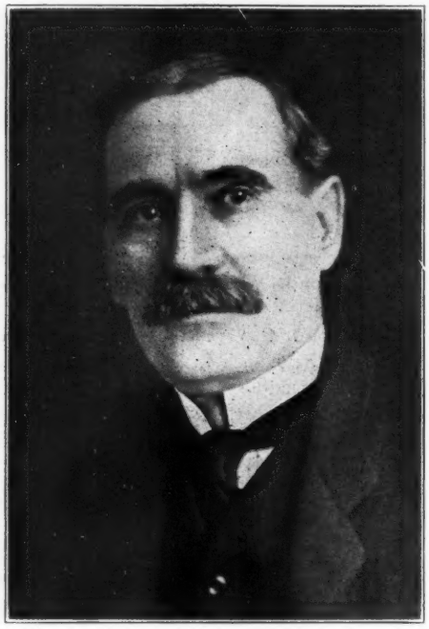
INDIANA prices on sand and gravel have been among the lowest in the United States, the Chicago district being the only competitor in low figures. Indiana plants are partly responsible for that. Indiana prices of sand and gravel advanced, between 1913 and 1918, on an average of 43.5% for sand and 41.0% for gravel, while the elements of cost, including labor, power, repairs, stripping and new equipment, increased in price 77% to 111%.—Indiana Sand and Gravel Producers Association News Letter.

Prominent Pennsylvania Quarry Operator Dead

GEORGE W. JOHNSON, a pioneer in the agricultural lime business of Pennsylvania and an operator of limestone quarries for 46 years, died at his home in New Castle, October 23.

Mr. Johnson, who was 72 years old, was president of the George W. Johnson Limestone Co., and a director of the Pittsburgh Limestone Co., the Keystone Limestone Co., and the National Limestone Co. He was known as one of the largest quarry operators in the United States.

Besides these extensive quarry operations he was active in the iron and steel industry.



George W. Johnson

Franklin P. Hunkins Dies

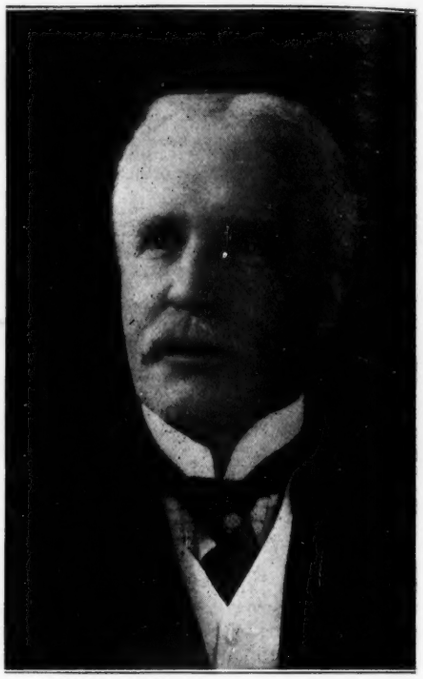
FRANKLIN P. HUNKINS, president of the Hunkins-Willis Lime & Cement Co., St. Louis, Mo., died November 3 at St. John's Hospital, following an operation for uraemic poisoning.

The operation was necessitated by the accumulation of a slow poisoning extending over many months, but the news of Mr. Hunkins' death came as a shock to many of his most intimate friends. He was 69 yers old, and had continued his business affiliations up to a few days preceding the operation.

Mr. Hunkins was prominent in business circles; besides being president of the Hunkins-Willis Lime & Cement Co., he was president of the Peerless White Lime Co., vice-president of the Glencoe Lime and Cement Co., and vice-president of the Mound City Roofing Tile Co.

Mr. Hunkins was married in St. Louis, in 1873, to Miss Fannie A. Blaetterman, by whom he is now survived. Three children are living—Darius S. Hunkins, Everett D. Hunkins, and Mrs. Rhodes Cave, wife of former Judge Rhodes E. Cave.

He was a member of the Mercantile Club and one of the first St. Louisans in the old Business Men's League, now the Chamber of Commerce.



Franklin P. Hunkins

Personals

John A. Henderson, of the Winnipeg Supply and Fuel Co., Ltd., Winnipeg, was in Chicago recently inspecting local quarries.

Ike S. Byrum, who has been with the Troy Wagon Works Co., Troy, Ohio, for eight years, took the position of sales manager when R. C. Sykes resigned that position to enter a personal business in which he is one of the controlling partners.

Incorporations

The Ohio Stone Co., Cleveland, Ohio, has been incorporated with a capital of $25,000.

The Acme Cement Co., Wilmington, Del., has been incorporated with $1,350,000 capital.

The Sidney Silica Sand Co., Philadelphia, Pa., has been incorporated with a capital of $40,000.

The Acme Cut Stone Co., Greely, near Kenwood, Mich., has been incorporated with $20,000 capital.

The Clay Products Co. of America, Philadelphia, Pa., has been incorporated with a capital of $5,000,000 to mine silica and rock silica sand.

The Kittanning Limestone Co., Kittanning, Pa., has been incorporated with $50,000 capital. The incorporators are C. E. Meals, Fred Norman, Chambers Frick, D. C. Morgan, Jr., and G. G. Titzell, Jr.

The Union Marble Co., St. Louis, Mo., has been incorporated under the laws of Missouri to do a manufacturing and jobbing business in marble, tile, mosaic, slate, granite and other rock products, with a capital stock of $15,000. Offices of the company will be located in St. Louis. The incorporators are: George S. Fox, Louis William, Fred Schreiner, Charles B. Maehl, Paul Nazro, Stanislaw Bernacki and David Gordon.

The Success Sand and Gravel Co., Vicksburg, Tenn., has been incorporated with a capital of $30,000. James M. Dutton and John Brunini are the incorporators.

The American Lime Kiln Co., New York City, has been incorporated with a capital of $2,000. E. C. Schmatolla and L. Z. Murray, 217 Broadway, New York, N. Y., are the incorporators.

The Morris Fertilizer Co., Bartow, Fla., is incorporated to produce pebble phosphate and is constructing a plant which will have a daily capacity of 1,000 tons of washed pebble phosphate.

The McChord and Harding Co., New York and Chicago, are developing beds of sand and gravel several miles below Natchez, Miss. A $300,000 dredging outfit and other equipment are to be installed. The rated daily output is 1,000 cu. yards.

Briner Bros. Stone Co., St. Louis, Mo., has been organized to do a general producing and manufacturing business in rock, stone and other quarry products, with a capital stock of $10,000. H. C. Briner, John Briner and L. L. Sullivan, all of St. Louis, are the incorporators.

The Ladd Lime and Stone Co., Cartersville, Ga., has been incorporated with $100,000 capital to produce hydrated lime and lump lime. The daily output will be 40 tons of lump lime and 50 tons of hydrate. L. T. Backus is vice president and general manager, and R. K. Meade is the consulting engineer.

Cement

The Federal Cement Co., operating at Owen Sound, Ont., propose offering $1,000,000 six per cent first mortgage bonds. It is understood that these will be offered in United States and Canada at par and interest, with a bonus of 50 per cent common stock. The Federal Cement Co. is incorporated under the laws of the State of Delaware and plans to remodel two large cement plants at Owen Sound so that they will produce 2,000 barrels of cement per day. The officers of the company are: President, J. G. Lind, vice president of the St. Mary's Cement Co.; vice president, J. E. Murphy, vice president of the Vancouver Portland Cement Co.; treasurer, J. E. Campbell, secretary-treasurer of the Hepworth Mfg. Co.; secretary, A. D. Creasor, of Owen Sound.

Manufacturers

The Atas Powder Co., Wilmington, Del., announce the removal of their general offices to 140 North Broad Street, Philadelphia, Pa.

The Ross Power Equipment Co., Merchants Bank Building, Indianapolis, Ind., have ready for circulation an itemized list of machinery on hand. This includes engine sets, motors, air compressors, steam, oil and gas engines, boilers and generators.

The Bradley Pulverizer Co., Allentown, Pa., reports that there has been unusual activities in the sale of Griffin Mills. The latest purchasers are the Seminole Phosphate Co., Croom, Fla.; the Phoenix Portland Cement Co., Nazareth, Pa., and the Chirchfield Portland Cement Corporation, Kingsport, Tenn. Griffin mills also are being exported to Venezuela and Japan. The Bradley Hercules Mill, which has won considerable note as a preliminary pulverizer, is of especial interest to cement manufacturers.

The Barber-Greene Co., Aurora, Ill., have ready for circulation a very complete and well presented catalog, No. 3, consisting of 32 pages and presenting power-driven, portable conveyors and elevators of all descriptions. This catalog also makes a specialty of self-feeding bucket wagon loaders. It is claimed that the conveyors and elevators are light, strong, easily portable, and that they are easily adaptable to any class of work; being great time and labor savers in all cases. The distinguishing feature of the bucket loader is the rotating double disk at the base of the feeder which does the work of several men and very greatly increases the range of the machine. The booklet is well illustrated and well worth the time of those interested in such machines.

Quarries

Waukesha, Wauwatosa and other Wisconsin quarries will be shut down, due to the general order of the railroad administration requiring quarry materials to be shipped in closed cars after November 1. More than 1,800 miles of highways, from 70 to 90 per cent complete, will be left unfinished, it is announced. The Wisconsin Mineral Aggregate Association protested the order Tuesday.

The Pittsburgh Limestone Co., operating a large quarry at Nessle, W. Va., along the Potomac River, has resumed work on orders given from headquarters at Pittsburgh. The resumption of work is accepted as an indication that the steel strike is waning. The output had been reduced to about 60 per cent by the strike.

The Marble Cliff Quarries Co., Columbus, Ohio, suffered a fire loss last week estimated at $75,000 when an agricultural limestone drier became overheated. The flames spread to the frame structure. After a four hours' fight the Columbus fire department was able to extinguish the flames.

The Casparis Stone Co., near Logansport, Ind., will ship the output of its plant to the Sandusky Portland Cement Co., of Syracuse, Ind., where it will be used in the manufacture of cement. The Syracuse company in the past manufactured its product from marl secured at Lake Wawasee, but as the privilege of dredging this body of water has been taken away from them by the Indiana general assembly, a contract was immediately closed with the Casparis Stone Co.

Sand and Gravel

The Defrain Sand Co., which has been operating six dredges in the Delaware River, has purchased six farms of 200 acres each at Penn's Manor, near Philadelphia, Pa.

The Murphy Construction Co. has purchased the Carl Brockmann property just north of Manitowoc, Mich., on the Shoto Road. The property contains about five acres and will be utilized as a gravel pit by its new owners. Modern machinery will be installed and the pit will be operated as a commercial enterprise. The land lies directly south of the old pit owned by the city of Manitowoc, and the gravel coming from it is of a good quality for road and concrete work.

The Odell-Daley Material Co., of Joplin, Mo., which operates the sand plant at this place, has orders for more than 100 carloads of sand.

Retail Dealers

The Alliance Fertilizer Co., Alliance, Ohio, will erect a large phosphoric acid plant to double its present output.

The Quarry Supply Co. will be incorporated under the laws of Pennsylvania to buy and sell machinery, tools, cement, sand, lumber and all general supplies.

Construction of yard additions, repairing and remodeling of quarters in general, have been extensive during the last month at many St. Louis building supply yards. The Hydraulic Press Brick Co., of St. Louis, has let the contract for the construction of an open shelter at one of the company's yards at 4010 Gravois Avenue, at a cost of about $1,000. Donk Brothers Coal and Coke Co., also dealers in building supplies, have just completed the erection of two new shelters and other improvements in several yards throughout the city. The Polar Wave Ice and Fuel Co., with several offices and yards in the city, has let contracts for the erection of new yards and improvements at Kings Highway and San Francisco avenues, and also at Union and Natural Bridge roads. The Blackmer & Post Pipe Co. has just completed the erection of an addition to the shelters at the yards, 5584 Arthur Avenue.

CLASSIFIED ADVERTISING

Rates for advertising in the Classified Department: 2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Plants For Sale

FOR SALE

LIMESTONE PROPERTY consisting of approximately 100 acres, estimated to yield a very considerable tonnage of exceptionally high grade stone, suitable for burnt lime, hydrated and agricultural purposes. Situated on Southern Railway in heart of Piedmont section of N. C., and approximately 200 miles from nearest lime quarry. For further particulars, address

P. O. Box 743 Winston-Salem, N. C.

Large Gravel Pit For Sale

Good quality. High price for all of output. Fine location for cement factory. Equipped with trackage. Good reason for selling. Address

Box 1339 Care of Rock Products

Positions Wanted

WANTED

Position as Superintendent of large lime and stone plant. Long experience. Address **Efficiency Expert, care of Rock Products.**

Manager or Superintendent

of heavy quarry operation wishes to correspond with some good crushed stone producer, who is expecting to make a change the first of the coming year. Address

Box 1340 Care of Rock Products

Positions Wanted

Sand and Gravel Business Opportunity Wanted

Experienced Civil Engineer, member of American Society of Civil Engineers, desires to organize and operate a sand and gravel plant located near a good market for the material. I have most of the capital required, but wish a certain amount of local capital in the enterprise. I know the business and would like to correspond with parties knowing of a suitable gravel deposit and desiring to join me in this business. **Address**

F. I. LOUCKES

L. & P. Canal Louisville, Ky.

WANTED

Position as quarry superintendent. Am now connected with the government. Have had years of experience in construction and operation of plants and can furnish the highest of references. Address

Box 1342 Care of Rock Products

Foreman or Superintendent

desires a position with lime or stone company. Understands the business thoroughly. Address

Box 1338 Care of Rock Products

Help Wanted

WANTED

Master Mechanic for plant half mile from city of 60,000 people, containing jaw and gyratory crushers, revolving and shaking screens, small tram line, locomotives, steam shovels, etc. New plant, electrically driven. Married man preferred but not essential. Two and one-half hours from New York. State salary expected and full experience. Address

Box 1344 Care of Rock Products

Superintendent Wanted

General Superintendent for Lime and Stone Plants. Must be able to get production and be an all-around quarry man.

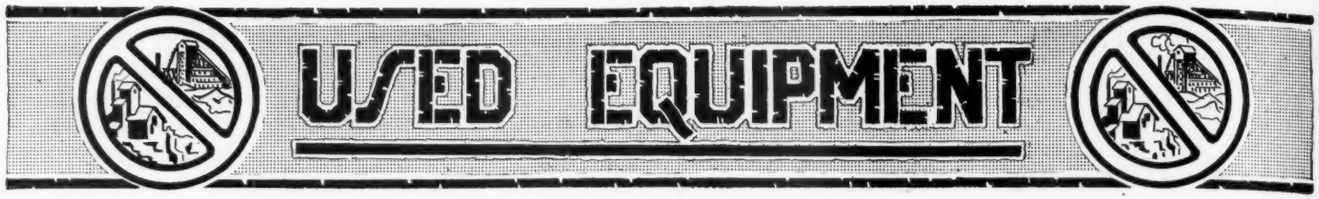
Add. Box 1341, care ROCK PRODUCTS.

WANTED

Assistant Sales Manager for Eastern Lime Plant. State salary, experience and when can assume duties.

Box 1343 Care of Rock Products

You are reading this ad. So are others. That is why it will day you to advertise in these columns.



Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

We Have Added to Our Large Stock of

CRUSHING EQUIPMENT

For Immediate Delivery

One No. 7½ Gyratory
One 10″x16″ Blake Crusher
Two 15″x24″ Blake Crushers
One 3′ 6″x2′ 6″ Ball Mill
Two 8″ "Bulldog" Gyratories
Two 16″ "Bulldog" Gyratories
Two 42″x16″ Crushing Rolls
One 54″x20″ Crushing Rolls

We are adding to this stock daily. Write us of your requirements.

TRAYLOR ENGINEERING & MFG. COMPANY
ALLENTOWN, PENNA.

New York 30 Church St. | Chicago 1414 Fisher Bldg. | Pittsburgh 211 Fulton Bldg. | Los Angeles Citizens Bank Bldg. | Spokane Mohawk Block

FOR SALE

20—Crushers, No. 2 to 10, mostly Gates.
2—327 HP. W. T. boilers, 180 lbs. $9.50 HP.
9—150 HP. 125 lb. H. R. T. boilers, butt strap.
1—No. 10 K Gates Manganese fitted crusher.
1—No. A7 Jeffrey pulverizer.
1—No. 4 crushing plant, motor drive.
1—No. 3 crushing plant, engine drive.
1—No. 9 K Gates Mang. fitted, Rt. Angle Dr.
2—48″x12′ Taylor Manganese screens.
1—No. 8 C. & W. Gyratory crusher.

Send us your inquiries for electrical equip- engines, hoists.

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

FOR SALE

140 H. P. LaZIER double cylinder natural gas engine, duplicate ignition system with air compressor, steel air storage tanks and 3 h. p. engine complete with all necessary fittings. Outfit is nearly new and in first class condition. Full details and price on request.

SCOTTSVILLE SAND & GRAVEL CO.
Rochester, N. Y.

WANTED

Gyratory Crushers
2 No. 6, direct drive.

Thurber Stone Crushing Co.
Thurber, Texas

RAILS

All sections of new and second-hand, on hand for quick shipment. Also purchase old and abandoned plants for dismantling purposes.

M. K. FRANK, Pittsburgh, Pa.

FOR SALE

1 No. 5 Austin Crusher.
1 No. 8 Gates Crusher.
1 No. 3 Gates Crusher.
2 No. 3 Universal Williams Mills.

H. A. JOHANN
1806 Railway Exchange St. Louis, Mo.

WANTED

Two Jaw Crushers, and 2 or 3 sets of Rolls. Address **A. B., Box 148, Middle Granville, N. Y.**

WANTED

Revolving Shovel Traction, 40 tons. Rock dipper, 1½ yds. State full particulars in first letter and whether owner or agent.

Thurber Stone Crushing Co.
Thurber, Texas

What have you to sell? What would you buy?

IN every issue of Rock Products you will find several pages devoted to those who wish to buy and sell used equipment. If you have some equipment to sell you cannot do better—for quick results—than to place an ad in the

Classified Columns

If you want to buy some used machinery, look in the used-equipment pages for it.

If you do not see what you want, advertise your needs in these columns. The cost is inconsiderable. The results—splendid!

Rock Products

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